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# Soviet Union

## FOREIGN MILITARY REVIEW

No 12, December 1987

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## FOREIGN MILITARY REVIEW

### Reponsibility of Military Personnel

*18010069a Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 3-6*

[Lead article]

[Text] The Soviet Armed Forces are preparing to worthily celebrate their 70th anniversary. Army and Navy personnel profoundly realize their measure of responsibility for security of the socialist homeland. By their selfless labor they are strengthening the Motherland's economic and defense might and striving to successfully accomplish tasks set by the 27th CPSU Congress. In evaluating the real military threat represented by imperialism's aggressive forces, the party considers the defense of our Motherland as the Soviet people's sacred duty.

The need for high combat readiness of the USSR Armed Forces is dictated by the complicated international situation and the hegemonic policy of the United States and its NATO allies. The CPSU and Soviet state will do everything necessary to keep the defense might of our country and of the entire socialist community at the proper level so long as reactionary circles whip up the arms race and so long as they have not given up a policy of social revenge and "crusades" against socialism.

The Communist Party is consistently and persistently struggling to implement V. I. Lenin's behests. Having drawn up a strategic course for accelerating the country's social and economic development at the April 1985 CPSU Central Committee Plenum and having made it the basis for its work, the party sharply posed the task of raising the personnel's responsibility for results of their activities. The 27th CPSU Congress emphasized that "the more consistently we involve the party's enormous creative potential in the job of accelerating the development of Soviet society, the more we can appreciate the profound substantiation of the April Plenum's conclusion about the need for raising the personnel's initiative and responsibility."

The question of intensifying the campaign for order and discipline is especially urgent in this respect. The higher the discipline, efficiency, and each person's sense of responsibility for an assigned job and for its results, the faster forward progress will be. Strengthening the legal basis of state and public life and steadfastly complying with socialist legality and law and order have been and remain a subject of the party's constant concern.

The party set a course toward broadening and deepening socialist democracy in connection with a restructuring and renewal of all aspects of our society's life. But democracy is not the opposite of discipline and order; to the contrary, democracy is conscious discipline and efficiency, it is order of a higher level based not on thoughtless obedience and blind execution but on the full-fledged, self-starting participation of the members of society in all affairs. Genuine democracy does not exist outside or above the law; it has nothing in common with permissiveness, irresponsibility, anarchy or social demagogy. It is called upon to promote a strengthening of lawfulness, discipline and order; a triumph of justice; and establishment of a healthy moral atmosphere in society.

If the observance of lawfulness, discipline, efficiency and order is so important for successful development of all our society, then it is even more necessary for the Armed Forces. The fact is that strong military discipline is the most important component of the Army and Navy's combat effectiveness and constant combat readiness.

Soviet military discipline differs fundamentally from usages in the armies of capitalist states. Its essence and character are determined by the very nature of our social system, of the Soviet state of all the people, and of the state's Armed Forces which stand guard over the achievements of socialism and the interests of workers—true proprietors of their country. Therefore military discipline is taken by servicemen as a perceived need, as a guarantee of the indestructible might of the USSR Armed Forces.

Military discipline in the Soviet Armed Forces is based on servicemen's high political awareness, profound understanding of their patriotic duty and our people's international tasks, and utter dedication to the Soviet Motherland, the Communist Party and the Soviet government. The key factor in military discipline is a deeply perceived obedience and execution, i.e., unquestioning obedience to the commander or chief and prompt, precise execution of their orders, instructions and commands. This provision stems from the fact that our commanders are plenipotentiaries of their people, the party and the state. Their orders are the Motherland's orders and they must fulfill them unquestioningly. Without this there cannot be a high combat effectiveness.

Military order, which envisages precise organization of the training process, interior, watch and guard duties, and the personnel's entire life and routine, is a constant influence on the instilling of responsibility. USSR Minister of Defense Army Gen D. T. Yazov emphasizes that "military order is regulation order. Imposing order in everything—alert duty, combat training, service, and day-to-day life of Army and Navy forces—should be viewed as the task to end all tasks and we should direct the will, energy, knowledge and experience of military personnel and all servicemen toward accomplishing it."

Successful accomplishment of assigned tasks depends largely on the work of Army and Navy officer personnel. Success of restructuring in the Armed Forces depends to

a decisive extent on how quickly and deeply command personnel will perceive the need for changes and how creatively and purposefully they will implement the party line.

High responsibility of military cadres for defense of the socialist homeland is reflected in their day-to-day activities of training and indoctrinating personnel and accomplishing combat readiness tasks. High responsibility presumes the concerted, coordinated, rhythmic work of commanders, political bodies, staffs, and party and Komsomol organizations. The personal responsibility of officers is judged in the final account according to the level of combat training of their entrusted unit or subunit, the level of discipline, and the personnel's moral-political and fighting qualities and readiness to successfully accomplish a combat mission.

The responsibility of officers is reflected above all in a conscientious attitude, in a state and party approach to an assigned job, in a Bolshevik irreconcilability toward deficiencies and toward indifference in work, in a thorough understanding of one's duties of indoctrinating personnel, and in the ability to give an objective assessment of one's activities. To understand this as the main guiding basis and to subordinate intellectual and moral qualities and organizing abilities to the job of indoctrinating and training personnel is a vivid manifestation of the high responsibility shown by officer cadres for an assigned job. Comrade M. S. Gorbachev emphasized at the 27th CPSU Congress that today we need a leader "closely linked with the masses who is ideologically convinced, who thinks with initiative, and who is energetic."

V. I. Lenin sharply posed the question of each person's responsibility for the fate of the socialist Motherland. He wrote: "What is most important is to achieve personal responsibility" (*Polnoye sobraniye sochineniy* [Complete Collected Works], Vol 53, p 301). In terms of a military organization the question of the role and responsibility of the organizer, leader, and commander-indoctrinator is of special significance. V. I. Lenin constantly emphasized that we "need both personal responsibility and personal direction," we need that arrangement of matters "so that it is impossible to avoid responsibility" (*Polnoye sobraniye sochineniy*, Vol 39, pp 428-429).

The responsible nature of military service in the Soviet Armed Forces is determined by the fact that our state's Army and Navy are called upon to protect the peaceful, creative labor of Soviet citizens, to defend the freedom and independence of the Motherland and achievements of the Great October, to ensure the security of the socialist community jointly with fraternal armies, to be a reliable bulwark of universal peace, and to be constantly in a high state of combat readiness. Its basis is a communist attitude toward military labor, a sense of duty, and constant striving for combat improvement. Like all other kinds of responsibility, responsibility for security of the socialist homeland is an effective motivation for military cadres' conscientious fulfillment of their duties, since this is the feeling that prompts the officer and general to answer to the party and the Soviet people for the quality and results of combat and political training.

Responsibility is based on a close interaction of both social as well as psychological aspects. It includes the following: an officer's awareness of his role in the job of ensuring the Motherland's security and awareness of the need for acting in accordance with the party's demands aimed at strengthening the Soviet Armed Forces' combat might and keeping them in a state of constant combat readiness; unremitting supervision over both his own and subordinates' actions with consideration of their consequences to himself and the military collective, self-accounting, and self-evaluation (self-monitoring); active social activities and conscientious fulfillment of social duties. Therefore it is impossible to regard responsibility only as the sum of some kind of norms or principles. It acts as the understanding shown by a serviceman—officer, NCO, private and seaman—of his own role and importance in military labor; it is a measure of activeness in one's combat improvement and in maintaining constant combat readiness of the unit and ship.

The combat readiness of any military collective is a state which determines its ability to enter combat in the shortest possible time, fight skillfully, and accomplish the combat mission under all circumstances. It presumes an alloy of each military person's moral-political, psychological, physical and professional readiness to perform his sacred duty to the Motherland to the end.

The basic elements of combat readiness are the personnel's profound communist conviction and utter dedication to the cause of the CPSU and Soviet people; strict observance of military discipline, regulation order and organization; the personnel's combat training and physical conditioning; the preparedness of command personnel including warrant officers [praporshchiki, michmany] to accomplish combat missions under all conditions of modern warfare and to direct subordinates firmly; the ability of party organizations and all party members to inspire servicemen by word and personal example for faultless execution of combat missions; the state of supply of modern weapons and combat equipment and keeping them serviceable and ready for immediate use.

The most important condition, the base of constant combat readiness, is the personnel's high political and moral state achieved through purposeful ideological and political indoctrination work by officers, warrant officers, and party and Komsomol organizations and closely tied in with the people's professional training. In other words, combat readiness integrally includes and presumes active use of the moral factor. The high demands placed today on each one's personal contribution toward

raising combat readiness stem above all from the aggressive essence of imperialism, which is capable of gambling the fate of all mankind for the sake of achieving hegemonic objectives. Hence the growing responsibility of military cadres in the modern stage of the Soviet Armed Forces' development.

Military cadres' ideological and political indoctrination holds an important place in shaping their high responsibility. Studying Marxist-Leninist theory and party documents always has been the paramount duty of officers, generals and admirals. Today good methods training of officers as propagandists also is required. The majority of them are political study group leaders, political briefers and members of agitation and propaganda collectives.

Responsibility finds concentrated expression in the Soviet officer's active position in life and in his moral example. Moral conviction, the socially useful nature of acts, initiative, imagination, irreconcilability toward negative phenomena in the military environment and unity of word and deed must serve as the foundation of an officer's social and moral make-up and his active position in life. A gap between word and deed destroys the integrity, persuasiveness and mobilizing force of an example and depreciates ideological efforts. This is why concreteness, businesslike efficiency, consistency, unity of word and deed, and glasnost must be actively introduced to the practice of party-political work. Today inertness, formalism, indifference, and the habit of drowning a vital matter in empty discussions are especially intolerable.

Now as never before there must be a decisive turn toward specific combat and political training tasks. Dissatisfaction over results, a critical analysis of what has been achieved, and a spirit of creativeness and innovativeness all open up a broad field of endeavor for officers. V. I. Lenin emphasized that the surest conclusions of the social and moral value of actions should be drawn from results and not just from words and feelings. He posed the question "By what signs are we to judge **real** 'thoughts and feelings' of **real** persons?" and answered it himself: "It is understandable that there can be only one such sign: these persons' **actions**" (*Polnoye sobraniye sochineniy*, Vol 1, pp 423-424).

A comprehensive strengthening of the authority of commanders and chiefs is an important condition for shaping healthy moral relations in a military collective. The mobilizing role of the example of an officer's professional expertise grows immeasurably under present-day conditions, when primary emphasis in training Army and Navy forces is placed on a further improvement in field, air and naval training and on its maximum approximation to real combat conditions.

Such moral qualities as kindness, honesty, simplicity, personal modesty, the ability to arrange proper relationships with colleagues, discipline, and responsibility must be inherent to an officer. Now instances of bureaucratism, conceit, haughtiness, drunkenness and abuse of official position become especially intolerable among officers when the party has begun a resolute campaign against negative phenomena and for the honest, pure countenance of the party member and leader.

A major role in instilling responsibility in command cadres is given to party and Komsomol organizations of units and ships. Using various kinds of work, they raise the official and sociopolitical activeness of officers who are party or Komsomol members and ensure their personal example in accomplishing tasks of combat training and strengthening military discipline. The arsenal of party and Komsomol organizations contains many forms for influencing the course of the training and indoctrination process. They systematically give effective help to those officers who do not have necessary command skills or are unable to display firm will, and they guide those who have no faith in the power of persuasion and stray onto the path of administration by mere injunction, peremptory shouting, and rudeness. It stands to reason that the paramount role in strengthening a particular officer's authority is played by that officer's own activities, personal behavior, exemplariness in observing Soviet laws and military regulations, and high sociopolitical activeness. An officer cannot enjoy authority among subordinates if he himself breaches military discipline and commits amoral acts. Even isolated displays of unconcern, conceit, careerism and irresponsibility in an officer's work and acts discrediting his honor are inadmissible. As a rule any work not backed up by the commander's personal example, especially work to strengthen conscious discipline, is ineffective and does not achieve the objective. Any deviation from standards of regulation relationships and any rudeness, tactlessness or connivance will be noticed immediately by subordinates and will have a negative effect on results of the servicemen's training, duty and indoctrination.

M. V. Frunze wrote in his work *Lenin i Krasnaya Armiya* [Lenin and the Red Army] that commanders and political officers are obligated always to remember Lenin's three conditions which are the sole guarantee of firm, conscious discipline. "The first condition is selflessness and steadfastness of command and political personnel; the second condition is preservation of a lively, integral link between these command personnel and the Red Army mass; and the third condition is for this Red Army mass to see the correctness of our leadership in practice and in action."

In carrying out restructuring, the party puts the issue of normalizing the moral and psychological atmosphere in party organizations and in collectives in a prominent place. Therefore work with people is brought to the foreground. Only by placing a person at the center of party work will we be able to accomplish the tasks advanced by the congress. The principal meaning of restructuring consists of turning to the people and to lively work.

The January 1987 CPSU Central Committee Plenum emphasized: "The Central Committee is firmly counting on Armed Forces cadres and the Soviet officer corps to accomplish tasks of strengthening the state's defensive ability, and it is sure that under today's complicated international conditions party members and all Army and Navy cadres will act with supreme responsibility and will raise and improve proficiency and combat readiness of all branches and combat arms. The Soviet people and our party are relying on their Armed Forces. They are doing everything to strengthen them and have the right to expect that no aggressive forces will be able to catch us unawares."



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**U.S. Rapid Deployment Force**
*18010069b Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 7-11*

[Conclusion* of article by Col S. Semenov]

[Text] Foreign military journals devote considerable space to questions of support to actions of the Rapid Deployment Force [RDF] in the CENTCOM "zone of responsibility." It is stressed, for example, that from the very beginning of the RDF's existence Pentagon plans have constantly placed great emphasis on creating [sozdaniye] a system of command and control, communications and intelligence for it. The ultimate objective of efforts in this direction is timely deployment of fixed ground facilities of that system in the RDF zone and coupling the system (including through satellites) with the Worldwide Military Command and Control System [WWMCCS] existing in the U.S. Armed Forces as well as with the sea, air and space reconnaissance system.

At the present time, in the absence for now of a broad contractual basis with the majority of countries in the CENTCOM "zone of rsponsibility" for placing fixed American military installations on their territory, problems of organizing long-range strategic communications and command and control of the RDF both in peacetime and in the initial stage of a military conflict are being resolved with the help of the DSCS [Defense Satellite Communications System] and the AFSATCOM and FLTSATCOM satellite systems (in this region the transceiving gear of these systems is accommodated aboard U.S. Navy ships and vessels in the Indian Ocean and the Mediterranean) and via American embassies and military missions (groups of military advisers) in a number of countries of Southwest Asia. In particular, a forward operations group of command headquarters was deployed aboard the command ship of the U.S. Navy command in the Middle East in 1983 as a forward point of CENTCOM operational command and control, with the group's direction exercised through the WWMCCS system. The group has direct communications with Headquarters CENTCOM at MacDill Air Force Base and with the JCS and USCINCEUR. This group is assigned missions of operational control of the forward RDF grouping in the initial stage of a military conflict, i.e., until a combat operations control center arrives and deploys in the command's zone.

With the arrival of the main RDF grouping in the CENTCOM "zone of responsibility," the communications and command and control system is organized according to a type scheme as in other TVD [theaters of military operations]. Main, forward and rear command posts are deployed using mobile ground communications equipment as well as the airborne command post of the CinC CENTCOM. The command staffs of branches of the Armed Forces assigned to the RDF grouping set up their own communications and command and control systems, but they are connected without fail with CENTCOM's unified system. It was reported that talks presently are being held with governments of a number of countries in the command's "zone of responsibility" about granting the United States rights to establish fixed ground installations on their territories for command and control and strategic long-range communications, including via satellite. Practical steps also are being taken to outfit Headquarters CENTCOM and RDF units assigned to it with new equipment which would permit setting up mobile air-transportable ground command and control and communications posts both at the strategic and at the operational-tactical level.

Reconnaissance in the interests of the RDF grouping in the CENTCOM "zone of responsibility" is organized and conducted constantly even in peacetime. Special, space, communications, electronic, airborne, seaborne and other kinds of military reconnaissance are used to accomplish these missions, as are other U.S. intelligence services, and the CIA above all. Flights by American SR-71 strategic reconnaissance aircraft from Akrotiri Air Base on the island of Cyprus, by AWACS aircraft permanently based in Saudi Arabia, by P-3C Orion land-based patrol aircraft from the air bases of Diego Garcia and Masira, and by other U.S. Air Force and Navy reconnaissance resources in the CENTCOM "zone of responsibility" are used in peacetime to collect data of interest to the Pentagon. These forces and resources also may be the basic sources of strategic intelligence collected in the interests of CENTCOM during a conflict. Organic reconnaissance forces and resources of units (ships) of all branches of the Armed Forces also will collect information on the enemy at the operational-tactical level on the eve of and during combat actions.

Questions of logistical support of the RDF hold a special place throughout the set of measures being taken by the American command to ready these forces for participating in a military conflict in Southwest Asia. The principle of organizing logistical support measures as a whole is to be implemented under the usual arrangement: centralized, down from above, within the framework of

branches of the Armed Forces assigned to the RDF grouping. At the same time the following features are considered in organizing logistical support for the RDF grouping deployed for fighting a war: the very remote nature of the CENTCOM "zone of responsibility"; insufficient provision of navigation and other facilities of the sea and air lines of communication from the United States to the Near East (the sea route across the North Atlantic through the Suez Canal to ports of the Persian Gulf extends approximately 9,000 nm,, across the South Atlantic around Africa it is 12,000 nm, and across the Pacific it is around 11,000 nm); absence of a sufficient amount of prepositioned supplies; and a poorly developed theater infrastructure.

Based on the region's features and difficulties connected with them, the American command plans to organize logistical support of the RDF grouping in a combined manner. Light weapons and the most needed supplies for forward RDF units are moved by air transport along with the personnel. Some of the heavy weapons, military equipment and supplies for Marine, Army and tactical air subunits of the RDF first echelon which is also moved by air already are stored aboard 17 store ships based at Diego Garcia Island. If necessary these ships can arrive in a designated area of the Near East in three days from the moment the order is received. The bulk of supplies which will be required for supporting combat actions of the main body of the RDF grouping is to be delivered from the United States by sea transport. The possibility of using a certain amount of the supplies in units and at depots of armed forces of the region's countries also is envisaged.

The entire set of tasks of organizing and implementing strategic movements of the RDF to its operational mission area, conducting combat actions, and giving them comprehensive support has been practiced annually for seven years now in exercises of a varying nature and scale conducted both within the CENTCOM "zone of responsibility" and on U.S. territory under near-real conditions.

Bright Star exercises are principal RDF activities regularly held on the territories of a number of Near East countries. The first of them, Bright Star-81, was held on the territory of Egypt in a desert area (100-120 km southwest of Cairo). This exercise, for which a battalion tactical group of the 101st Airborne Division and a tactical air group of the Air Force National Guard (a total of around 1,500 persons) were brought in, practiced for the first time, albeit on a limited scale, problems of moving troops by air from the United States to the Near East and organizing their combat actions in desert areas.

The scale of Bright Star exercises rose constantly in subsequent years. Ships and Marine units of the U.S. Navy as well as forces of the region's countries with pro-American regimes began to be included in them in addition to the U.S. Army and Air Force (Fig. 1 [figure not reproduced]). In addition, the exercises began to be held in several phases on the territory not only of Egypt (Fig. 2 [figure not reproduced]), but also other countries of the Near East and Northeast Africa. For example, Exercise Bright Star-82 was held on the territories of Egypt, Somalia, Sudan and Oman. Staffs of the XVIII Airborne Corps and 9th Air Force, units of the 82d Airborne Division and 24th Mechanized Division, Special Forces subunits, a tactical air wing, a squadron of B-52 strategic bombers, combatant ships, landing vessels and a Marine Expeditionary Battalion took part in it from the U.S. Armed Forces. During the exercise over 500 tracked and wheeled vehicles including tanks, APC's, heavy artillery and Army Aviation helicopters were moved by air and sea from the United States (Fig. 3 [figure not reproduced]) to the exercise areas (Fig. 4 [figure not reproduced]). There were 600 servicemen from the Egyptian Armed Forces, 600 servicemen from Somalia, 1,000 from the Sudan, and combatant ships from the Oman Navy taking part in the exercise. The total number of participants of Bright Star-82 exceeded 15,000. In this exercise the movement of an airborne assault force consisting of a reinforced battalion of the 82d Airborne Division (which made a nonstop flight in C-141 aircraft from the United States to a drop zone on the territory of Egypt) was accomplished for the first time in conducting major operational measures of U.S. Armed forces in remote theaters. Simultaneously an amphibious assault landing was practiced on the coast of Oman (by the U.S. Navy Marine Expeditionary Battalion and subunits of the Oman Navy), there was an operation in the Sudan by American, Egyptian and Sudanese Special Forces units to neutralize a partisan movement in that country, and in Somalia joint actions of American and Somali troops to support receipt of units arriving from the United States to reinforce the RDF grouping in the Near East and for its logistical support were practiced at the Berbera Military Base.

Subsequently Bright Star exercises began to be held regularly in the CENTCOM "zone of repsonsibility." The most typical was Exercise Bright Star-85 in which around 35,000 American servicemen alone participated; together with units of the armed forces of Egypt, Jordan, Somalia and Oman the total troop strength approached 50,000. The exercise involved over 25 combatant ships and auxiliary vessels of navies of participating countries and over 450 aircraft and helicopters. The last joint American-Egyptian Bright Star exercise was held in 1987 on the territory of Egypt in a state of total secrecy. It was held against the backdrop of an intensified build-up of American military presence in the Persian Gulf area and noticeably aggravated the explosive situation in the region.

In addition to Bright Star exercises, Jade Tiger exercises (practicing problems of air defense of RDF groupings, air combat actions and others), lesser both in scale and in the scope of missions practiced, also are held periodically in the CENTCOM "zone of responsibility," and there are command and staff and troop exercises such as Gallant Eagle, Gallant Knight and Quick Thrust on the

territory of the continental United States. Problems of the employment and combat and logistical support of contingents of branches of the U.S. Armed Forces earmarked for assignment to the RDF also are constantly practiced during operational activities held under staff plans of the Army, Air Force and Navy and of other unified and specified commands of the U.S. Armed Forces.

In covering the course of the exercises, the western press has emphasized that the basis of principles of RDF tactical employment in the CENTCOM "zone of responsibility" during a period of aggravation of the situation consists of a rapid movement by air (over a period of 1.5-3 days) to the operational mission area initially of a small mobile contingent of airborne (infantry) troops, Special Forces subunits, and several (1-2) squadrons of tactical aviation, and movement of a Marine Expeditionary Battalion from landing vessels of the U.S. Navy amphibious assault group constantly deployed in the Arabian or Mediterranean Sea. The primary mission of this forward grouping is to capture and hold key points and objectives (airfields, ports, oil industry enterprises and so on) in the conflict area until the arrival within 7-10 days of larger forces—the RDF first echelon. Special Forces detachments may be moved into this area by air and sea simultaneously or in advance. Their mission usually includes organizing and executing diversions, acts of sabotage and subversive actions against states in the region unfriendly to the United States and, conversely, helping to stabilize the internal situation in countries with pro-American regimes. These detachments also will accomplish missions in support of theater operations conducted by RDF groupings.

The RDF first echelon, which is usually landed on beachheads captured by forward units, can represent a rather powerful grouping: a reinforced airborne brigade, a light infantry brigade or division at full strength, up to six tactical air squadrons and a Marine Expeditionary Brigade. These forces deploy into combat formation in short periods of time and build up efforts to expand captured beachheads. They can organize an all-around defense with the objective of firmly holding the beachheads and they create conditions for receiving and deploying the arriving main body of the RDF grouping assigned for actions in the CENTCOM "zone of responsibility." After the main body deploys offensive actions are organized on separate axes with the objective of expanding the zone controlled by American troops and capturing and holding large, strategically important objectives, especially communication lines and junctions, major oil-producing facilities, and important political and administrative centers. Offensive actions of Army and Marine units usually are organized and conducted not across a solid front but on the most important operational axes (along roads and the seacoast), where small, highly mobile units and subunits (battalion and company tactical groups) are actively operating. Wide use is made of the drop (landing) of tactical airborne and amphibious assault forces. At the same time diversionary detachments of Green Berets, naval Special Forces subunits (in the coastal zone) and Ranger subunits (in the enemy's operational-tactical depth) step up activities in the deep enemy rear.

While the beachhead is being expanded RDF tactical aviation usually accomplishes its inherent missions of winning air supremacy, isolating combat zones and providing close support to ground troops; it also conducts aerial reconnaissance. If B-52 strategic bombers are assigned to the RDF grouping they can deliver bomb strikes against important enemy objectives (targets) in the depth by operating from airfields located a considerable distance away from this region.

Naval forces in the RDF accomplish missions of winning sea and air supremacy (using forces of deck-based aviation of carrier groups); deliver strikes against enemy ship groupings in water areas contiguous with ground combat zones; monitor shipping in those water areas; protect sea lines of communication; and support the ground forces of the assault force, especially Marines, by strikes of carrier-based aviation and ship weapon systems including Tomahawk cruise missiles against shore targets.

A defense may be organized on other secondary axes in the conflict area. As a rule this will be an all-around (nodal) defense and have both a positional and a mobile character. It will be structured according to the principle of creating company and battalion strongpoints of resistance on communication lines and junctions as well as holding objectives and areas of operational-strategic and even tactical importance.

Thus the RDF established by the United States is considered by the American military-political leadership to be an instrument for achieving its political and strategic objectives in the region of Southwest Asia above all. It is appropriately manned, outfitted, trained and prepared ideologically to implement American imperialism's aggressive policy in the world arena, especially in developing countries. This confirms once again on the whole the reactionary essence of the present American doctrine of "neoglobalism."

**Footnote**

*See beginning of article in ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 11, 1987, pp 3-10—Ed.



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## Japan's Participation in the U.S. Space Adventure

*18010069c Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 11-15*

[Article by S. Shumilin, candidate of economic sciences]

[Text] In the summer of 1987 Japan became the fifth country along with Great Britain, the FRG, Israel and Italy to officially join the American Star Wars program. It took the Land of the Rising Sun over two and a half years to cover the path from cautious approval of this militaristic program (we will recall that Japanese Prime Minister Y. Nakasone announced an "understanding" of SDI back in January 1985 during a meeting in Los Angeles with U.S. President R. Reagan) to the signing of an intergovernmental agreement on terms of Japanese participation in it. This is unquestionably no small amount of time, and western and above all official Japanese propaganda uses this circumstance as evidence of Tokyo's "weighed," "well thought out" approach to participation in plans for preparing Star Wars and its lack of desire to unconditionally express solidarity with the United States over the question of SDI.

In fact, however, inclusion in the program had been predetermined long ago. Although the Japanese leadership's official position for the time remained only the notorious "understanding," all necessary steps were being taken to materialize that "understanding" into collaboration in the space adventure.

After an official proposal was received from U.S. Secretary of Defense C. Weinberger in March 1985 to take part in SDI work, a staff was formed to study it. The staff included representatives of the Japan Defense Agency, the ministry of foreign affairs, the scientific-technical administration and other departments. A three-phase plan was developed for "drawing" Japan into this work; the final phase was to be detailed talks on specific contracts. Delegations of experts set off across the ocean one after the other to study SDI and determine those areas of SDI where Japan "could prove useful."

Without awaiting official decisions, some Japanese firms and organizations began collaborating with the United States in implementing Star Wars plans on a "trial" basis, if it can be thus expressed. For example, the Osaka University Laser Research Center began developing [razrabotka] a laser weapon in technical collaboration with the Lawrence Livermore Radiation Laboratory, one of the Pentagon's leading contractors in the SDI program. The Hoya Glass Company concluded a contract within the framework of this program (pledging, by the way, that it would not attempt to learn the ultimate purpose of the products delivered). Back in 1983 the American affiliate of Hitachi Kinjoku Corporation began delivering powerful magnetic elements needed for developing [razrabotka] combat lasers to the Los Alamos Research Center.

The tactic of "quietly creeping" into SDI of course was not advertised. Moreover, excuses were heard when particular facts attesting to its adoption became generally known: Japan allegedly was forced to take part in SDI inasmuch as the United States firmly insisted on this, threatening inevitable punishments in case of insubordination.

There is a particle of truth in those words: U.S. steps aimed at including Japan in SDI were in fact at times nothing more than twisting a partner's arm. It is not superfluous in this article to recall once more the official invitation to take part in the program which the head of the Pentagon sent to Japan as well as to a number of other U.S. allies in March 1985. It so strongly resembled an ultimatum in form that the press dubbed it "Weinberger's ultimatum." And wasn't the not unfamiliar interview of former Assistant to the President for National Security Affairs R. Allen by the Japanese newspaper SANKEI SHIMBUN in which he placed prospects of Japanese export to the United States in rigid dependency on Japan's position on the question of Star Wars really not a kind of ultimatum? Many such examples can be cited of unconcealed pressure attesting to Washington's enormous interest in involving Japan in plans for militarization of space, and this interest itself is well known and explicable.

Above all the Reagan administration is counting on strengthening political support of its adventuristic plans in this manner under conditions of a very negative reception given the plans by political parties, scientists, and broad public layers in many countries of the world. In this respect Japan's participation in SDI is especially valuable for the United States because, as the White House believes, it helps convince skeptics of the program's "defensive" nature: Can there be any doubt of this when work is being done on it by a country with an "atomic allergy" which suffered the bombings of Hiroshima and Nagasaki?

At the same time, with the help of SDI Washington would like to impose its military-political aims on Japan to an even greater extent and restrict Japan's opportunities for following an independent political line, particularly with respect to the USSR and other socialist countries. In other words, Washington would like to keep the Land of the Rising Sun—a key ally in the Asiatic-Pacific region—within the channel of American foreign policy.

The Star Wars initiators hope to turn Japan's S&T potential into added support for SDI. They are interested in this country's achievements in the most varied fields. Lt Gen J. Abrahamson, director of the SDI Organization, pointed out in an interview by a Japanese radio broadcasting company that "Japan is a technically developed state and there are a great many spheres in which we would like to cooperate." But as the foreign press writes, the United States shows special interest in work of creating [sozdaniye] next-generation computers and their software; communications, navigation, target

identification and guidance systems; electro-optical and other electronic equipment and its components (microcircuits with a high degree of integration, gallium arsenide gates, flat displays and so on); new materials (particularly ceramic and composition materials as well as antiradar coatings); rocket engines; robotics; computer aided design; and signal processing methods and devices. Washington also is counting on Japan's help in developing [razrabotka] kinetic weapons and a directed energy transfer weapon.

An object of special attention is Japanese territory, which the United States proposes to use for stationing various elements of the BMD [ballistic missile defense] system being created [sozdavat] within the framework of SDI: not just surveillance and communications equipment supporting combat actions in space, but also space weapons such as antisatellite weapons.

The desire to overcome trends in economic rivalry with this country unfavorable to the United States by involving Japan in the implementation of SDI plans also plays more than a minor role. Japan's economic might is growing at rapid rates: its share of gross national product [GNP] of countries of developed capitalism approximately tripled in the postwar period, and in industrial production it increased by more than sixfold to 14-16 percent. At the same time, although the United States remained the basic economic force of modern imperialism, it lost its dominant position in the world capitalist economy to a certain extent. While in the early 1950's it accounted for over half the cumulative GNP and industrial production of the developed capitalist world, at the present time it accounts for around 40 percent. In the postwar years the United States has given way to Japan in labor productivity growth rates. Japanese export grew at outstripping rates, which led to a sharp aggravation of both countries' rivalry in world markets. A reflection of this is the change in their foreign economic positions; for example, the U.S. share of world capitalist export of goods and services, which in the early 1950's was approximately 25 percent, dropped to 15 percent by the mid-1980's. At the same time, the similar indicator for Japan rose from 1 to 12 percent. Under these conditions the United States figures that by including its far-eastern rival in SDI it not only places Japanese resources at its service but also hampers Japan's economic and S&T development [razvitiye]. In other words, Washington would like to "share" with its rival the economic difficulties connected with the program's implementation (above all the drain of specialists, capital and so on from the sphere of civilian R&D).

Nevertheless, the pressing by Washington, interested in a partner for implementing its space adventure, is only one (and not the most important) aspect of the matter. Enormously more important is the fact that Japanese monopolies showed a most lively interest in participating in the project. It is commonly known that their role in the country in shaping foreign policy, including its military aspects, is exceptionally great. The largest firms including Mitsubishi Jukogyo (it accounts for around 20 percent of all orders from the country's military department), Kawasaki Jukogyo, Fujitsu, Nissan and many others have made requests for participation in SDI. All of them hope to snatch a large sum from the multibillion-dollar appropriations for the program and at the same time receive certain benefits from the United States in acquiring S&T innovations. Some companies also consider involvement in SDI as almost the only method to financially strengthen the S&T "foundation" of their own military production. Even with the country's constantly growing militarization, this military production often remains too small (by virtue not only of the narrowness of the domestic market, but also of existing limitations on arms exports*) to keep R&D expenses from becoming an excessive "load" on production cost. It was this incentive of the monopolies above all that dictated the decision of Japan's military-political leadership—a trusty servant of monopoly capital—to include the country in the SDI.

At the same time such a decision is a step toward hegemonic aspirations of Japanese military circles, which hope to elevate Japan's status as a military power through Star Wars and in general through cooperation with the United States in the military sphere which began with the conclusion of the notorious "security treaty" between Tokyo and Washington in 1951.

While involving the country in the SDI "in the open," Nakasone's cabinet also took many other factors into account. In particular, it considered the traditional nature of Japan's S&T ties with the United States in the military area. In the opinion of official Tokyo, participation in the program was to become a "natural continuation" of joint research in the sphere of military technology which began back in 1956 with work in 15 directions. Japan's involvement in research and development of individual components of the SDI system also was viewed as an important step along the path toward acquiring experience and even creating a start for developing [razrabotka] the country's own models of weapons of the future. Moreover it was considered that participation in the SDI will help reduce the negative balance of Japan's S&T exchange with the United States, which has reached enormous proportions: for example, in 1985 the assets of American corporations in technological trade with Japan comprised over $800 million.

With such a "broad" approach, however, the opinion of those who condemn plans for drawing Japan into the "star adventure" was ignored. Meanwhile strong opposition to these plans exists in the country. Broad layers of Japanese society, opposition parties, analysts and many representatives of business circles protest participation in the SDI. Even within the ruling Liberal-Democratic Party itself there is no unanimity in this matter.

Those against Japan joining the SDI point out that it is leading to a violation of the country's constitution, of the parliamentary resolution on space R&D exclusively for

peaceful purposes, and of the so-called "three non-nuclear principles": not to produce, not to import, and not to have nuclear weapons on Japanese territory. Military export restrictions also are being violated. All this gives a certain freedom of action to those circles which favor Japan's militarization and the elimination of those obstacles to the arms race which still exist in the country.

Great doubt is cast on the economic expediency of joining the SDI. It is pointed out, for example, that the drain of foremost technology from vitally important areas cannot help but have a most negative effect. U.S. assurances that the technological flow being drained allegedly will have a "Japanese tap" do not stand up to criticism. As the progressive Japanese press writes, this is confirmed if by nothing more than the sorry experience of the FRG, which concluded an agreement with the United States about participation in the SDI and under terms of the agreement was forced to give its overseas partner all rights to the use of research results obtained by West German firms within the framework of the program.

The Japanese government attempted to "sidestep" the cited arguments of opponents by means of complicated maneuvers. It unfolded a powerful propaganda campaign justifying its actions. An attempt was made in particular to depict the SDI program as allegedly having a peaceful direction not contradicting the 1972 ABM Treaty between the USSR and United States and contributing to the preservation and strengthening of the military-political alliance of western countries.

Then a broad offensive was unfolded against those who rejected participation in the Star Wars program from the standpoint of protecting the aforementioned parliamentary resolution, the "three non-nuclear principles," and Japan's economic interests. In so doing the conservative government usually did not trouble itself to search for arguments that were the slightest bit serious, resolving problems, in the words of the newspaper TOKYO SHIMBUN, "with a simple reference to U.S. assurances." Thus, having taken up the proposition widely propagandized by the Reagan administration about the allegedly non-nuclear nature of the SDI, Tokyo rejected out of hand the objections of defenders of the "three non-nuclear principles." But a special position was developed for the question on which the largest number of public protests was concentrated: Didn't Japan's participation in the SDI violate the parliamentary resolution banning space research for military purposes? The resolution allegedly referred only to the Japanese program of developing outer space, and since the SDI was an American program, participation in it did not contradict the resolution.

But the Nakasone government had "insured" itself several years back regarding the question that involvement in SDI work would entail a breach of existing restrictions on military deliveries abroad. It concluded an agreement with the United States on 8 November 1983 about a transfer of military technology to the United States and thus "legitimized" the earlier government decision that the "three principles with respect to arms export" did not extend to this transfer.

The theme of aggravation of the "trade war" between Washington and Tokyo was very resounding in the propaganda campaign which unfolded. As it is known, in 1986 Japan was "responsible" for more than a third of the American foreign trade deficit ($59 billion out of almost $170 billion), and under these conditions the United States took various steps to reduce the import of Japanese products. This circumstance was used by the leaders of the Land of the Rising Sun to depict participation in the SDI as an inevitable payment for removal of tension in trade and economic relations with the United States.

Of course such maneuvering required much time, but in the final account it helped the government to weaken somewhat the wave of public indignation, to initially (in September 1986) adopt a "political decision" in favor of Japan's participation in the SDI, and later (in July 1987) to conclude a corresponding agreement with the United States.

Just what did the Japanese leadership "achieve" by agreeing to a "military-space" deal? It is true that too little time has passed since it was concluded to speak of all the consequences, but even now western specialists are summing up the first results. In any case hopes that Washington would share results of SDI research with Japan proved groundless. According to reports received, a monopoly on the results remains with the United States. How the United States will dispose of this monopoly was shown with all obviousness by the notorious "Toshiba affair," where Toshiba was accused by the United States of the unlawful sale to the USSR of technology having a military purpose.

The groundlessness of the argument that the Japanese-American deal on the SDI will contribute to elimination of trade and economic contradictions between the two countries also stands out clearly. Right after its conclusion reports appeared in the press about the Pentagon's decision to refuse to purchase 90,000 Toshiba portable computers for the U.S. Air Force and to place the $104.5 million order with the American Zenith Data Systems corporation. We will recall that the signing of the SDI agreement was (or in any case was depicted by official Tokyo circles as) largely compensation to the United States for the "damage to its national security" which the Toshiba concern allegedly inflicted by delivering several milling machines with numerical control to the USSR. It is characteristic that the concern received that blow from the American partners even though, as reported, it made a request for joining in work on the SDI.

Meanwhile something else is obvious: having set a course toward practical involvement in preparing Star Wars, Tokyo assumed no small amount of responsibility (and the Soviet Union specifically stated this) for whipping up the arms race and extending it to outer space. Japan's participation in the SDI poisons the political atmosphere in the Far East and throughout the Asiatic-Pacific region. It radically contradicts the interests of peace and threatens the security of peoples.

**Footnote**

*An arms export ban, included for the first time in the instructions on export control approved back in 1949, is in force in Japan. Later in 1967 Prime Minister E. Sato proclaimed in the Parliament three principles for rejecting the export of arms. In accordance with them Japan rejected "export of arms to socialist countries; to states to which arms export is banned by UN resolutions; and to countries which are or can be engaged in international conflicts." In 1976 the government of T. Miki pledged, in addition to previous conditions, also to restrict the export of arms to states not mentioned in Sato's three principles and declared the intent to observe caution in exporting equipment and technology related to arms production—Ed.



6904

## Plans for Creating an ABM System for Europe

*18010069d Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 16-17*

[Article by Col I. Ignatyev]

[Text] Two diametrically opposed approaches can be clearly traced in international politics connected with questions of limiting arms and of disarmament at the present stage. It is common knowledge that a reduction of Euromissiles is becoming realistic because of new political thinking displayed by the Soviet leadership, and the end result could be total elimination of medium and lesser range ballistic missiles (the "double zero" version). At the same time, hawks from the United States and other NATO countries are attempting to make such reductions dependent on creation [sozdaniye] of so-called defensive systems with offensive kinds of weapons. They are trying to drag out the resolution of this matter and weigh it down with unacceptable conditions. At the same time they are demanding an acceleration in the development of parallel work of creating [sozdaniye] a tactical ABM defense system, i.e., a continuation of a weapons build-up in this region. In the initial stage such a system was designed for combating enemy operational and operational-tactical missiles in Europe which partially go beyond the framework of the accepted definition of missiles as "medium and lesser range."

Research to create [sozdaniye] a tactical ABM system was made one of the directions of the SDI program and is being conducted in accordance with a directive from Deputy Secretary of Defense W. Taft signed on 28 January 1987. General direction of all work is assigned to the Organization for Implementing SDI, within the framework of which a special tactical systems division was formed. Industrial firms both from countries which have officially joined the SDI (Great Britain, the FRG, Italy and Israel) as well as of certain other European states, particularly France, Belgium and Holland, are participating in the research along with U.S. military-industrial corporations. Their activities are being coordinated under the aegis of the U.S. Organization for Implementing SDI within the framework of seven international consortiums which have been formed and in which some 30 industrial firms from European countries are taking part. The chief role in the consortiums is given to such very large Pentagon contractors as Lockheed, Hughes, Ling-Temco-Vought and RCA.

In military planning agencies of the United States and European countries of NATO as a whole there still is a lack of precise impressions about the structure and combat make-up of the ABM system and possible time periods for its deployment. Preliminary work to study the system was planned for two phases. In the first (up to the middle of 1987) it was planned to perform an analysis of the general environment of nuclear missile weapons which might take shape in European TVD [theaters of military operations] during combat actions and to determine the possible structure of a tactical ABM system capable of accomplishing assigned missions. During the second phase it was planned to develop [razrabotat] operational requirements for the system and specifications for the basic equipment on a competitive basis. Subsequently it is planned to create [sozdat] and conduct range tests of system components with consideration of the results obtained.

Some $45 million were allocated from the SDI budget in fiscal year 1987 to begin research on the ABM system for Europe, and it is proposed to increase appropriations for it to $70 and $80 million respectively in fiscal years 1988 and 1989.

The U.S. and NATO commands believe that creation [sozdaniye] of a tactical ABM system is best accomplished by successively modernizing the air defense system deployed on the territory of the bloc's European countries. It is emphasized that weapons capable of destroying not only ballistic missiles, but also cruise missiles in flight must be included in it. The foreign press has reported that deployment of the ABM system essentially could begin on the basis of specially modified ZRK [surface-to-air missile systems], radars and automated air defense control systems of American and West German manufacture. The American improved Patriot and Hawk surface-to-air missile [SAM] systems of the ground forces, the shipboard Standard SAM system and also one of the Israeli shipboard SAM systems are mentioned as

weapons suitable for this purpose. The fundamental possibility of employing such systems against ballistic and cruise missiles was demonstrated in particular in September 1986 at the American White Sands, New Mexico ABM range, where a Patriot SAM system hit a Lance tactical missile at an altitude around 8 km. This experiment was widely covered by the mass media in the United States for purposes of advertising the "high tactical characteristics" of this American weapon.

Subsequently, in the assessment of NATO specialists, a tactical ABM system in Europe could be strengthened by including in it a laser weapon, electromagnetic cannon and chiefly short-range ABM interceptors such as are being created [sozdavatsya] in the United States under the Star Wars program for use at the third (final) line of the multiechelon defense system with space-based components. It is proposed also to transfer to the European ABM system such SDI components as means for surveillance of ballistic and cruise missiles and for controlling combat actions. They include above all space, airborne and aerostat means of detecting missile warheads and giving target designations to ABM weapons.

Judging from foreign press reports, development [razrabotka] of the principal technical equipment for the ABM system can be accomplished in the first half of the 1990's, construction of its first phase can be accomplished at the end of the current century, and full deployment in European theaters can be completed approximately by the year 2010. According to preliminary estimates of western specialists, overall expenditures for the program can be $30-50 billion.

It is known that by joining the SDI as a whole European NATO countries viewed it in their plans from the very beginning as a "goose laying golden eggs." But what is important for the United States is not so much the allies' participation in creating [sozdaniye] a strategic and tactical ABM system as it is the demonstration of NATO solidarity and support of the American initiative by North Atlantic Alliance participants. Therefore the lion's share of funds appropriated for the new direction of the arms race inevitably will end up in the safes of U.S. military-industrial corporations. To this end Washington showed timely concern for protecting its own interests by adopting a special decision on organizing joint work with other countries in this area. In accordance with that intent, contracts with foreign firms for developing [razrabotka] ABM system equipment will be concluded only in those cases where the Pentagon confirms in writing the impossibility of performing corresponding research by efforts of American companies. As a result of such discriminatory measures, foreign economists believe that the European countries together will be able to receive no more than one percent of appropriations for the program.

The involvement of European countries (especially those having their own offensive nuclear arms) in developing [razrabotka] ABM equipment graphically demonstrates the distorted logic of strategic thinking. Great Britain's position is indicative. It is trying to combine participation in American ABM programs with the desire to retain its own ballistic missiles under all conditions, viewing this as the sole guarantee of peace. It is obvious to all that extending the SDI to the field of tactical arms potentially would complicate the process of expanding the parties' mutual confidence, generate illusions about the possibility of achieving military-technical superiority over the Soviet Union, and in the final account reduce international security.

An ever-growing number of people on the planet recognize that the only correct solution along the path of achieving firm peace is being proposed by the Soviet Union, which advanced a program for general nuclear disarmament by the end of the current century. The basis of this program is total elimination of all kinds of nuclear weapons and rejection of the development [razrabotka] and deployment of space attack arms.



6904

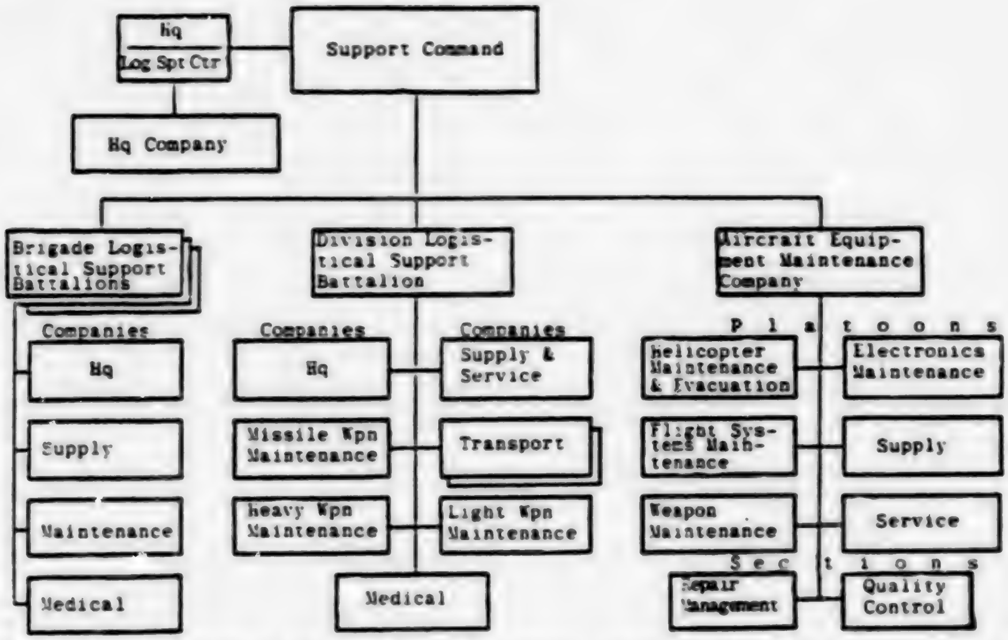
## U.S. Army "Heavy" Division Support Command

*18010069e Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 19-21*

[Article by Maj V. Shapovalov]

[Text] The desire of the U.S. military-political leadership to achieve global and regional supremacy over the Soviet Union is clearly manifested in the course of implementation of a long-range Army organizational development program known as "Army-90," with one of its central elements being an improvement in "heavy" type units. These units (mechanized and armored divisions) are to be employed chiefly for conducting combat actions of high and medium intensity in the European Theater of War. The American command believes that an effective logistical support system is one of the basic conditions for ensuring success in combat. In this connection the conversion of "heavy" divisions to a new organization and establishment, their outfitting with up-to-date models of weapons and military equipment, as well as a change in their tactical employment methods made it necessary to reorganize rear organs, the basis of which is the division support command.

The division support command is intended for resolving problems of supply, maintenance and repair of weapons and military equipment as well as field servicing and mechanical and administrative support of troops. According to the American command's concept, conversion of the "heavy" division support command to a new organization and establishment should improve flexibility of employment of the forces and resources included in it, bring them closer to first echelon troops, and free




the commanders of tactical brigades and battalions of the functions of immediate control over logistics in order to concentrate their attention on accomplishing only combat missions. Initially in accordance with the Division-86 program it was planned to introduce three brigade logistical support battalions to the support command while retaining already existing battalions in its make-up: maintenance, transport and supply, and medical. But after the Army command made the decision to form "light" units without increasing the Army's overall size the proposed organization and establishment was revised and partially reduced.

Judging from the latest foreign press reports, at the present time the "heavy" division support command includes a headquarters and MTO [logistical support] center, headquarters company, three brigade logistical support battalions, a division logistical support battalion and an aviation equipment maintenance company (see diagram). The personnel strength is around 3,000.

The **headquarters and logistical support center** are placed in a common control body (under the old organization the center was part of the headquarters company). In the opinion of American military specialists, their merging should ensure greater coordination of plans drawn up by the staff for using forces and resources of th- division rear with its capabilities of satisfying troop materiel needs. The headquarters and logistical support center perform planning, accounting and control functions and are responsible to the division commander and staff for organization of logistical support. Their mission additionally includes preparation of data for the division commander's decisionmaking on organizing troop logistical support, briefing his staff and higher rear echelons on the status and requirements of the unit's logistical support system. The logistical support center directly collects, processes and analyzes supply requests from combat units and subunits and sends them to the logistical support center of the higher logistics organ, and it draws up proposals for distributing supplies, keeps an accounting of their presence and consumption, and monitors timely replenishment of basic supply necessities. During combat actions a rear command post is set up on the basis of the division support command headquarters which includes a combat operations control center intended for command and control of forces and resources used in accomplishing missions of security and defense of the division rear area.

The headquarters consists of eight sections: chief of staff; operations, planning and security; logistical support; automation equipment; rations; medical; administrative; and military priest (chaplain). The logistical support center includes two departments (planning and control, automation equipment) and five sections (general supply items, ammunition, weapons and military equipment, ZAS [crypto equipment], and maintenance). The automation equipment department has a computer center which processes data for division logistical support services.

The total personnel strength of the headquarters, logistical support center and headquarters company (intended for service and security of the headquarters and logistical support center) is around 200.

The **brigade logistical support battalion** (approximately 460 persons) has the capabilities of providing troops with all kinds of supplies (with the exception of items of everyday use), performing medium repair of all kinds of ground weapons and military equipment (except crypto)

and providing medical assistance. In the presence of appropriate reinforcing forces and resources from the corps support command, the battalion is capable of accomplishing field services including personnel washing, clothing replacement, special decontamination of troops and equipment, as well as burial of the dead. The battalion includes a headquarters and four companies: headquarters, supply, maintenance and medical.

The supply company has ten fuel supply vehicles (the capacity of one tank is 19,000 liters). In addition, it is capable of setting up an ammunition transfer point in the brigade rear area with an output of up to 270 tons per day.

The maintenance company includes mobile teams for repairing mechanized and tank battalion weapons. Their number and specific purpose are determined by the brigade composition. Maintenance teams are outfitted with sets of appropriate equipment and special tools accommodated in truck van shops.

The primary mission of the medical company is to provide first aid and assistance to the sick, wounded and injured in the brigade rear area for the purpose of preparing them for evacuation to the division rear area.

The battalion commander plays a special role in organizing brigade logistical support. Previously the support command staff would send officers to brigade staffs for coordinating logistical support; they were responsible only for organizing coordination of the division rear staff with the brigade commander. Now however the brigade logistical support battalion commander performs the function of a unified brigade rear operations officer. At the same time he organizes security and defense of the corresponding rear area and controls all forces and resources used for this purpose, the latter being subordinate to him.

The **division logistical support battalion** (around 1,100 persons) is intended for logistical and medical support of its organic and attached units and subunits located in its rear area. If necessary forces and resources can be assigned from it to reinforce brigade logistical support battalions. The battalion includes a staff and eight companies: headquarters, supply and service, missile weapon maintenance, light weapon maintenance, heavy weapon maintenance, two transport companies and a medical company.

Battalion forces and resources permit providing troops with all kinds of supplies, organizing their water supply both in the division rear area and in brigade rear areas, providing field servicing of troops in the presence of appropriate means of reinforcement, assigning transport equipment for moving troops and cargoes in division interests (replacement of subunits in forward areas, delivery of supply items to brigade logistical support battalions, hauling division supply reserves and so on), performing medium repair on all organic division weapons and military equipment (except that in the brigades' inventory), and deploying a clearing-triage point for giving first aid and preparing sick and wounded for further evacuation, as well as a 160-bed medical aid post for treating sick and wounded not requiring hospitalization and capable of returning to formation in no more than 4 days. The battalion supply and service company is equipped with 26 fuel supply vehicles (tank capacity 19,000 liters), and it is also capable of deploying an ammunition transfer point in the division rear area with a capacity of up to 270 tons per day.

The **aviation equipment maintenance company** (260 persons) is the foundation of the division army aviation maintenance facility. Its forces and resources permit performing medium repair on helicopters and their on-board systems including armament and electronics, assisting army aviation brigade maintenance subunits in repairing on the spot and evacuating aviation equipment, and supplying division army aviation subunits with appropriate spare parts. The company also can provide maintenance and supply spare parts to other army aviation subunits in the division rear area. During combat actions the company deploys in the immediate vicinity of the army aviation brigade. It has a headquarters, six platoons (helicopter maintenance and evacuation, flight systems maintenance, weapon maintenance, electronics maintenance, supply, and service) and two sections (maintenance control and quality control). If necessary it can be reinforced by appropriate maintenance subunits as well as by ground and air transport resources of corps subordination.

In the Army command's assessment, forces and resources of the "heavy" division rear are capable of accomplishing missions of providing logistical support to the unit's combat actions in light of demands specified by provisions of the "air-land operation (battle)" concept. Meanwhile, as American rear specialists believe, capabilities of rear organs can be realized most fully on condition of their further saturation with automation equipment.



6904

## U.S. Army Combat Training (Planning and Control)

*18010069f Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 22-25*

[Article by Col Yu. Groshev, candidate of military sciences]

[Text] U.S. Army command plans for further improving the effectiveness of unit and subunit combat training place great emphasis on its planning and control. It is believed that the quality of classes and in the final account troop combat readiness will largely depend on this.

**Planning combat training.** The basis for this planning is a Secretary of the Army order for combat training for the training year. It specifies only general directions of troop training, gives time periods of mandatory activities (exercises, maneuvers, activities on the ranges of other countries and so on) held in accordance with troop combat training plans, and gives the training time (for the year).

Higher staffs draw up recommendations, training plans, instructions, methods directives and so on to achieve uniformity in organizing and conducting combat training and to save unit commanders time in planning.

Divisions and separate brigades draw up orders and general plans for combat training. The orders specifically set training objectives, time periods, phases, and inspection standards. In addition they give the number and time periods of exercises and other activities under senior commanders' plans, the procedure for accomplishing tasks of ideological conditioning, logistical support of classes, assignment of combat arms subunits to tactical groups, procedure for using the training facility, and ammunition and fuel consumption norms. They also include information necessary for appropriate commanders to plan the combat training of their subordinate subunits and to organize control over its progress, and they indicate the accountability procedure. General plans are drawn up for the training year in divisions and separate brigades and then are updated each quarter. A graphic combat training plan and list of basic activities are appended to the combat training order.

Source planning documents in mechanized and tank battalions are ARTEP (Army Training Evaluation Program) 7-15 for Army combat training and combat readiness evaluation, FM 21-6 manual for organization and conduct of combat training, TC 21-5-2 combat training instructions, and instructions for improving class ratings.

The Army Training Evaluation Program is a document which includes all necessary materials for organizing the combat training of personnel and subunits of permanent readiness divisions and provides commanders with information on various questions of structuring the training process. It specifies basic training objectives and gives sample training problems for training and evaluating the battalion, company, platoon and squad (crew, team), and it sets forth requirements on how to evaluate the capability of subunits to perform combat missions under near-combat conditions. It is at the same time also a reference document for subunit commanders, leaders and combat training instructors in compiling subunit training programs, training plans and class schedules. The program consists of 13 chapters. The first four set forth general provisions revealing its content, training missions, methodology of conducting classes, duties of commanders at various levels in organizing personnel training, questions of compiling planning documents and monitoring and accounting for combat training, and safety measures in holding classes. The next two chapters enumerate training missions of the 3d, 2d and 1st levels in training and evaluating the combat readiness of battalions, companies, platoons and squads (crews and teams). A separate chapter is devoted to antitank training, and the remaining chapters set forth missions for training mechanized (tank) subunits jointly with subunits of other combat arms and special forces. In addition, program annexes list the training literature, methods aids, training films, and official instructions, manuals and orders which must be used during training. A table for expenditure of ammunition and simulation equipment allocated for working training missions also is attached.

The manual for organizing and conducting combat training and the instructions on combat training are used as annexes to the program. They contain recommendations on developing training tasks and provide a series of methods advice on holding classes. The instructions for improving class ratings is the principal document which specifies norms for each serviceman and for subunits as a whole.

Battalion combat training programs and plans are drawn up for six months. The basis in compiling them for companies is the content and sequence of training missions prescribed for the battalions and can be approximately as follows: fulfillment of appropriate norms in individual and special training by individual servicemen and as part of mechanized (tank), antitank, mortar, reconnaissance and air defense squads (crews, teams), platoons, companies and battalions; special training aimed at familiarization with (study of) crew-served weapons and receipt of a class rating; performance of other tasks under the ARTEP 7-15 program (antitank training, combat actions under special conditions and so on).

Detailed combat training plans for the quarter and detailed charts for two weeks are compiled in companies on the basis of the battalion commander's instructions, the ARTEP 7-15 program, and norms and the instructions for improving class ratings. They are made known to the personnel a month before the beginning of classes and are changed only in exceptional instances.

The established norms for companies provide the basic direction for combat training in platoons and squads and determine the content of subunit training as a whole (according to American terminology, performance of group training missions). Platoons and squads draw up detailed weekly plans which are announced two weeks in advance. Companies draw up class schedules for five days of the week.

The so-called principle of decentralization is the basis for organizing combat training in the Army. It consists of granting rather broad rights to battalion and company commanders to independently organize the subunit training process. They themselves can determine the

content of combat training and the sequence and time periods for working training tasks, and they can choose the forms and methods of conducting classes. Battalion and company commanders are given an opportunity to take an imaginative approach to the requirements of programs and introduce their own changes for more effective accomplishment of combat training missions, taking into account the personnel's abilities and their military and psychological training, each subunit's level of training and teamwork, and their combat missions.

That procedure for organizing combat training in the battalion has a strict sequence. Initially missions are determined for each subunit and the battalion as a whole according to their combat mission, and the end results of training are determined. Then there is an analysis of these tasks and of the capabilities of battalion subunits and personnel to achieve them, conditions are established for performing each task, and norms and grading indicators are determined. Then the training level of personnel and subunits is analyzed, the discrepancy between the necessary training level and the existing level is determined and the possibilities of eliminating it are evaluated.

Based on the analysis of the level of the personnel's training and subunits' teamwork and of combat training tasks, the commanders themselves determine the training tasks on which they must concentrate efforts, which ones should be repeated and which ones can be omitted entirely. In some cases the battalion or company commander can even include basic training course topics in the combat training plan if the personnel need this based on their training level.

In decentralized organization of combat training, training tasks are made known to each serviceman, subunit and unit in commensurate form; combat teamwork tasks are differentiated and the sequence of their performance is precisely specified. Battalion and company commanders necessarily take into account the organization and establishment, manning level, and technical outfitting of their subunits as well as mandatory combat training activities to be conducted under senior commanders' plans and specified by training programs, and the availability and status of the training facility.

In organizing combat training by this method, methods instructions recommend not progressive training from squad to battalion, but simultaneous training at all levels, which has to be done selectively with consideration of the needs and capabilities of a particular subunit. For example, if insufficient squad teamwork in the attack has been identified in Company A, its personnel train in actions as part of squads in offensive combat. At this same time Company B may practice antitank training tasks and Company C may train in airmobile combat actions. The time for practicing training tasks is not specified. Training is conducted until the desired level is reached.

In the opinion of foreign specialists, that approach is based above all on the possible decentralization of troop actions in modern combat, success of which will depend largely on the training of subunits and cohesiveness of their actions. Application of the principle of decentralization permits taking into account more specifically the actual conditions under which combat training will be accomplished and contributes to an increase in the commanders' responsibility.

Another approach to structuring the training process also is not precluded. It is reflected in greater centralization in the organization and direction of combat training and its more consistent conduct. Even in this case, however, commanders are given independence in organizing and conducting combat training.

The western press emphasizes that different approaches to organizing combat training in the U.S. Army are dictated above all by the personnel's degree of training. For example, the first method usually is used if a subunit or unit is manned for the most part by servicemen who have gone through the basic training course in training centers and units. But the second method is used if a greater number of subunit or unit personnel are servicemen who have not taken a basic training course at training centers or the level of their training is below that required. Experience indicates that both methods oftentimes mutually supplement each other.

**Monitoring combat training progress.** The work of commanders at all levels and combat training take place under the constant supervision of higher staffs and senior commanders, who have the duty of determining basic training missions, organizing necessary logistical support, and performing an inspection and evaluation of combat training.

Monitoring combat training progress is viewed by the U.S. Army command as a very important component of the training process which stimulates systematic work of fulfilling program material, improving the professional expertise of servicemen and making subunits cohesive. It permits effectively establishing the personnel's level of training to perform their functional duties and the degree of subunit and unit combat readiness.

The foreign military press notes that the basic forms of monitoring combat training progress consist of inspections, which are viewed as part of combat training and are held with great intensity. Up to 14 percent of training time is set aside for them. As American military specialists classify them, they are group or individual based on the composition of inspectors and they are routine, practice or full field depending on the method and time of conduct.

Group inspections are held to determine the degree of training and combat teamwork of subunits and units; individual inspections are held to determine the level of servicemen's individual training and to identify deficiencies in it.

Group routine inspections (i.e., inspections of the subunit as a whole) usually are held by the training commanders and by representatives of higher headquarters during daily training to monitor subunit and unit combat teamwork, to determine the extent and quality of training material covered, and to reveal training deficiencies.

Group practice inspections are held with squads (crews), platoons, companies and battalions to determine conformity of the combat readiness level they have reached to indicators established for them at the end of each quarter; their positive evaluation is official confirmation of fulfillment of training tasks of one level of difficulty and authorization to go on to another. During these inspections subunits and units accomplish practice tactical missions in a complex with other training subjects. For example, a battalion is moved into the field with means of reinforcement; here during the time set aside for the inspection its subunits perform control missions successively from squads (crews) to the battalion as a whole, from which the evaluation of their combat readiness is determined. Special attention here is given to the teamwork of subunits; their ability to combine fire and maneuver; swiftness, correctness and precision in executing tactical procedures and actions in varying modern combat situations; rational use of the terrain, equipment and kinds of weapons; maintenance of close coordination with attached subunits; and the commanders' ability to control subunits in combat.

If a subunit receives an unsatisfactory evaluation if only for one of the established indicators (norms), the inspection is postponed and the subunit is given time to remedy the deficiencies. A repeat inspection is planned no earlier than six weeks after the first.

Individual routine inspections in the training process are held (by the selected method) by battalion commanders and staffs and by company and sometimes platoon commanders at least once a week with a mandatory grading for progress. If it is found during the inspection that a soldier has not mastered the training program in the given phase, additional classes are arranged with him and a repeat inspection is held a week later. With a positive result the platoon commander announces this to the officer keeping a record of company combat training and the soldier continues to train as part of his own subunit. But if he again fails he is sent to "soldier's school" (a training battalion) to take a special intensive training course.

Practice inspections of servicemen's individual training are usually held once a quarter by battalion staff officers jointly with representatives of brigade staffs to evaluate fulfillment of established indicators. In addition, individual training is inspected during qualification tests (once every half-year).

Full field inspections are carried out according to plans of higher echelons for a comprehensive study and evaluation of the training of personnel and subunits as a whole and of the organization and methodology of combat training and level of combat readiness.



6904

## Handheld Antitank Rocket/Missile Launchers

*18010069g Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 25-31*

[Article by N. Nikolayev]

[Text] Handheld antitank [AT] rocket launchers which appeared at the end of World War II have become a mass means for engaging tanks and other armored vehicles in close combat. Foreign military specialists believe that they also have retained their importance at the present time as an organic weapon of infantry squads and platoons.

The modern RPG [handheld AT rocket/missile launcher] is a relatively simple weapon which includes a launching tube, rocket/missile (with shaped charge warhead) and sight. Antitank rocket/missile launchers abroad are divided into light and heavy. Light launchers are served by one person; the team for heavy launchers consists of two or three persons. Handheld AT rocket-/missile launchers are expendable or reusable. The tactical-technical characteristics of handheld AT rocket/missilelaunchers of foreign armies are given in the table.

The foreign press notes that as armor protection of tanks develops [razvitiye] capitalist countries work to improve handheld AT rocket/missile launchers. The work is aimed above all at increasing range and accuracy of fire, increasing armor penetration, and reducing revealing signs (sound, flame and smoke when a round is fired). In addition to creation [sozdaniye] of new models, launchers which have been in the inventory for a long time now are being modernized.

In the **United States** the basic authorized model is the M72A2 66-mm light expendable handheld AT rocket launcher (Fig. 1 [figure not reproduced]). M20 rocket launchers were removed from the Army inventory in the 1960's and the M67 later was replaced by the Dragon AT guided missile system.

The M72 handheld AT rocket launcher has a simple design including a telescopic launching tube serving at the same time as a container for carrying one rocket, a firing and trigger mechanism, and a sight. The launching tube consists of two parts: an outer part of glass fiber reinforced plastic, and an inner part of aluminum alloy. The sight is a leaf with graduations for laying at ranges from 50 to 350 m, as well as an aperture sight. The leaf scale permits introducing an aim-off when firing at armored targets moving at a speed up to 24 km/hr. The

**Tactical-Technical Characteristics of Handheld Antitank Rocket/Missile Launchers of Capitalist Countries**

| Model, Year Operational | Rocket Caliber, mm | Weight, kg: Handheld Antitank Launcher / Rocket | Length of Launcher, mm: Traveling / Firing Position | Rocket Muzzle Velocity, m/sec | Effective Range of Fire Against Tanks, m | Armor Penetration, mm |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **United States** | | | | | | |
| M72A2, 1974 | 66 | 2.30/1 | 893/655 | 145 | 200 | 300 |
| M20, 1953[1] | 88.9 | 5.5/4 | 1549/803 | 100 | 150 | 280 |
| M67, 1957[1] | 90 | 15.8/4.2 | 1340/1340 | 220 | 400 | 350 |
| **Great Britain** | | | | | | |
| LAW-80, 1987 | 94 | 9.5/4 | 1500/1000 | 330 | 500 | 600 |
| **FRG** | | | | | | |
| Panzerfaust 44-1A1, 1959 | 44 | 9.2/2.1 | 1162/880 | 107 | 200 | 320 |
| Lanze, 1975 | 44 | 10.3/1.5 | 1162/800 | 168(210)[2] | 400 | 370 |
| Armbrust, 1979 | 67 | 6.3/1 | 850/850 | 220 | 300 | 300 |
| Panzerfaust 3, 1985 | 110 | 12/3.8 | 1200/1200 | 165(250) | 400 | 700 |
| **France** | | | | | | |
| LRAC-89, 1969 | 88.9 | 8.2/2.2 | 1600/1168 | 300 | 400 | 400 |
| APILAS, 1985 | 112 | 9/4.3 | 1290/1290 | 290 | 330 | 700 |
| AC 300 Jupiter, Test | 115 | 12/3.5 | 1200/1100 | 180(275) | 330 | 700 |
| DARD-120, Test | 120 | 14/3.5 | 1600/1200 | 280 | 300 | 800 |
| Sabracan, Test | 130 | 13.5/4.5 | 1600/1200 | 210(275) | 300 | Over 800 |
| **Italy** | | | | | | |
| Folgore, 1986 | 80 | 17[3]/3 | 1850/1850 | 380(500) | 700[4] | 400 |
| **Sweden** | | | | | | |
| Carl Gustav M2, 1957 | 84 | 14.2/2.6 | 1130/1130 | 310 | 400 | 400 |
| Miniman, 1968 | 74 | 2.9/0.9 | 900/900 | 160 | 200 | 340 |
| Carl Gustav, M2-550, 1972 | 84 | 15/3 | 1130/1130 | 200(350) | 700 | 400 |
| AT-4, 1986 | 84 | 6/3 | 1000/1000 | 290 | 300 | 450 |
| **Belgium** | | | | | | |
| RL-83 Blindicide, 1970 | 83 | 8.4/2.4 | 1700/920 | 120(300) | 400 | 300 |

**Tactical-Technical Characteristics of Handheld Antitank Rocket/Missile Launchers of Capitalist Countries [continued]**

| Model, Year Operational | Rocket Caliber, mm | Weight, kg: Handheld Antitank Launcher / Rocket | Length of Launcher, mm: Traveling / Firing Position | Rocket Muzzle Velocity, m/sec | Effective Range of Fire Against Tanks, m | Armor Penetration, mm |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| **Spain** | | | | | | |
| M-65, 1974 | 88.9 | 6 / 2.3 | 1640 / 850 | 215 | 450 | 430 |
| C-90-C, 1985 | 90 | 3.95 / 2.4 | 840 / 840 | 185 | 300 | 450 |
| **Israel** | | | | | | |
| B-300, 1981 | 82 | 8 / 3 | 1350 / 755 | 250 | 400 | 400 |
| Picket, Test | 81 | 6 / 4.2 | 700 / 700 | 500 | 500 | * |

Key:
1. Removed from U.S. Army inventory
2. Here and further the rocket/missile flight speed at the end of the powered flight phase is given in parentheses
3. Weight of mounted version 25 kg
4. Range of fire against tanks for mounted version reaches 1,000 m

AT rocket has a shaped charge warhead, nose-base piezoelectric fuze, solid-propellant rocket motor and six-fin unit which opens in flight. Octol explosive is used as the bursting charge.

This rocket launcher was used by the Americans in the war in Vietnam. At that time a number of its deficiencies were identified (misfires, hangfires, spontaneous disassembly of the rocket along the flight path) which required a certain modification of this model. As a result the M72A1, A2 and A3 modifications appeared which were adopted by the U.S. Army and armies of certain other NATO countries. In the early 1980's specialists of the Norwegian state company Raufoss Ammunisjonsfabrikker, which was producing the M72A3 under American license, improved the rocket and thus permitted an improvement in firing accuracy and armor penetration. The rocket launcher was given the index M72-750. Work to improve the M72A3 also is being done in the United States. A new version, the M72E4, presently is being tested.

General Dynamics created [sozdat] and prepared the Viper handheld AT missile launcher for series production to replace the M72 family of rocket launchers, but despite an order for the first lot it was not adopted by the American Army because of insufficient armor penetration and rather high cost. After comparative tests were held in the mid-1980's in which West European models also were represented, the U.S. Army command decided to purchase and deliver to the ground forces (over a period of five years) more than 360,000 Swedish AT-4 84-mm launchers (Fig. 2 [figure not reproduced]). It is noted that around half of them will be made under license by the American firm of Honeywell.

In **Great Britain** this year the LAW-80 94-mm handheld AT weapon (Fig. 3 [figure not reproduced]) was adopted by the ground forces and will replace the Swedish Carl Gustav and American M72A1 launchers presently in the Army. A design feature of the new British handheld AT weapon is the presence of a 9-mm self-loading spotting rifle mounted beneath the launching tube. This launcher also has been purchased by Jordan.

In the **FRG** Bundeswehr infantrymen have been armed with the Panzerfaust 44-mm handheld AT rocket launcher of FRG development [razrabotka] and with its improved version, the Lanze, for engaging armored targets in close combat. In addition, there is a considerable number of Carl Gustav launchers produced in the FRG under license from the Swedish firm of FFV.

In the early 1970's specialists of the West German concern of Messerschmitt-Boelkow-Blohm created [sozdat] the Armbrust 67-mm handheld AT weapon. Its design provides for the absence of flame and smoke when a round is fired as well as a significant reduction in sound intensity, which is especially important when firing from an enclosed space. The basis of its operation is the so-called "arbalest" principle, which consists of the following. A propelling charge is contained in the central

part of the launching tube between two tight-fitting pistons. The projectile is in the front part of the tube and in the rear is a filler of light synthetic material which performs the role of an absorber of the energy of powder gases. When a round is fired both pistons displace in opposite directions with great velocity. The front piston shoves out the projectile and the rear piston shoves out the filler. When they reach the tube faces the pistons lock, blocking the escape of powder gases.

The design of another recently adopted handheld AT weapon, the Panzerfaust 3 (Fig. 4 [figure not reproduced]) created [sozdat] by the West German firm of Dynamit Nobel, uses the "Davis cannon" principle. Its essence is that to kill recoil force a "countermass" equal to projectile weight is shoved backward out of the rear of the tube. As a rule it consists of small light particles (plastic plates, strips, flakes), the velocity of which is quickly killed by air resistance, because of which the danger zone behind the launcher operator is considerably reduced. The journal MILITARY TECHNOLOGY notes that an advantage of this principle over the rocket principle (used in the American M72A2 rocket launcher) and recoilless gun principle (on which the Swedish Carl Gustav launcher operates) is that it provides the opportunity of conducting fire from spaces of limited volume and using an over-caliber projectile.

For an additional decrease in flash, smoke and sound when a round is fired and to achieve an acceptable weapon weight, designers of the Panzerfaust 3 handheld AT weapon undertook to decrease the projectile's muzzle velocity to 165 m/sec. A sustainer motor which begins to operate after the projectile emerges from the tube and approximately 10 m from the operator, accelerating it to a speed of 250 m/sec, was installed in the projectile to increase effective range and reduce flight time.

The use of an over-caliber projectile (110 mm with a tube caliber of 60 mm) and the presence of an extensible probe in its warhead permitting formation of a shaped-charge jet at the optimum distance from the target provide for penetrating armor more than 700 mm thick, according to a statement of Dynamit Nobel representatives. Some western specialists believe that the Panzerfaust 3 is heavy for an infantryman (it weighs 12 kg in a loaded condition). At the same time they do not deny the significance of a psychological factor such as the confidence of a serviceman who is equipped with a reliable and effective albeit heavy launcher.

In **France** the LRAC 89 (Fig. 5 [figure not reproduced]) reusable handheld AT rocket launcher was the authorized model up to the beginning of the 1980's, and it also is in the inventory of armies of more than 15 African countries. Its launching tube is made of glass fiber reinforced plastic. Before firing a container with rocket which serves as a continuation of the tube is attached to its rear. The rocket is stabilized on the trajectory by a vane assembly which opens after exiting the tube.

The expendable APILAS (Fig. 6 [figure not reproduced]) handheld AT rocket launcher was adopted by the Army in 1983. During the period 1984-1988 it was planned to deliver some 72,000 such launchers. The foreign press has reported that the American firm of Olin Winchester Group purchased a license from the French firm of Manurhin for producing this handheld AT rocket launcher, which was named the Stingshot in the United States.

The APILAS rocket launcher consists of a launching tube-container made of glass fiber reinforced plastic, a removable 4X optical sight, a trigger and firing mechanism, shoulder rest, safety cover, and rocket-assisted shaped-charge projectile stabilized in flight by rotation (15 revolutions per second).

According to foreign press reports, the probability of hitting a stationary target (a tank) is 0.96 and for hitting a moving target at a speed of 10 m/sec it is 0.73 when firing the APILAS handheld AT rocket launcher from the shoulder at a distance of 300 m. When the rocket launcher is mounted on a tripod and an electro-optical guidance unit is used the effective range against tanks increases from 300 to 500 m.

In 1982 the firm of Luchaire created [sozdat] on an initiative basis jointly with the West German firm of Messerschmitt-Boelkow-Blohm the Jupiter AC 300 handheld AT rocket launcher, the operating principle of which is the very same as for the Armbrust handheld AT weapon. This permits firing from small enclosed emplacements. Firing of the handheld AT rocket launcher is not accompanied by flame or smoke and sound intensity is lower than when firing a pistol.

The over-caliber rocket-assisted projectile is fitted with a shaped-charge warhead. There is a probe in front which triggers the charge at the optimum distance from an armor obstacle. A rocket motor engages on the initial leg of the trajectory, increasing the projectile's muzzle velocity from 180 to 275 m/sec. Stabilizer fins open up when it emerges from the launching tube.

French specialists presently are developing [razrabatyvat] a shaped-charge warhead with two tandem charges for the rocket. The SOPELEM OB-25 low light-level night sight is mounted on the rocket launcher for firing during hours of darkness.

Another new French model is the DARD 120 120-mm handheld AT weapon created [sozdat] by the state company Societe Europeenne de Propulsion. Its design consists of a launcher and container with rocket-assisted projectile, which is fastened to the rear of the launcher before firing. The launcher's overall length reaches 1.8 m, which is noted as a deficiency by foreign specialists.

The container, serving also as a launching tube, is made of composition material. The projectile is located in its forward section and a "countermass" (a large number of glass balls) in the middle. The operating principle of the DARD 120 weapon is the very same as for the West German Panzerfaust 3.

According to foreign press reports this handheld AT weapon is fitted with a telescopic sight. Hit probability when firing at a stationary tank at a distance of 300 m is 0.82. Maximum effective range against tanks increases to 600 m using a laser rangefinder.

The highest armor penetration indicators (over 800 mm) were demonstrated in firing the Sabracan 130-mm rocket launcher created [sozdat] by the firm of Thomson Brandt, but it is still in the prototype stage.

In developing [razrabotka] handheld AT weapons French specialists place great emphasis on improving firing accuracy, especially against moving armored targets. To this end existing sights are being improved and new sights and even miniature fire control systems are being created [sozdavatsya] including a laser rangefinder, devices for determining leads and inputting necessary corrections, and a night sight.

In **Sweden** ground forces are equipped with the light expendable Miniman 74-mm handheld AT weapon and the heavy Carl Gustav 84-mm weapon.

The first consists of a launching tube, firing device and sight. The launching tube is made of glass fiber reinforced plastic. Its rear section contains a propellant charge and the front section a shaped-charge projectile (stabilized in flight by an opening fin assembly). The weapon is fired from the shoulder.

The Carl Gustav handheld AT weapon was developed [razrabotat] in the late 1950's. In addition to Sweden, it is in the inventory of armies of many capitalist countries including Great Britain, the FRG, Denmark, Canada, the Netherlands and Norway. The rocket launcher is served by a team of two persons. Fire is conducted with quick-fire fixed rounds with shaped-charge, fragmentation, smoke and illuminating projectiles.

An improved version of this handheld AT weapon was created [sozdat] in 1972 and designated the M2-550. It is equipped with a new sight and rocket-assisted shaped-charge projectile. Subsequently a lightweight version of the weapon, the Carl Gustav M3, appeared and later was adopted by the Danish Army. At the present time an over-caliber FFV 597 135-mm shaped-charge projectile has been developed [razrabotat] (Fig. 7 [figure not reproduced]), which is capable of penetrating armor up to 900 mm thick, as reported by the journal INTERNATIONAL DEFENSE REVIEW. The projectile weighs around 8 kg.

The AT-4 84-mm AT launcher is an expendable close combat weapon. It includes a launching tube made of glass fiber reinforced plastic, a trigger and firing mechanism, mechanical sight, shoulder rest and shaped-charge projectile. It is planned to replace the light Miniman weapon in the Swedish Army with this handheld AT launcher.

In **Italy** infantrymen are armed with the obsolete American M20 88.9-mm handheld AT rocket launcher. This year some 800 Folgore AT rocket launchers and up to 37,000 rockets for them have been ordered for the Army. The firm Breda Meccanica created [sozdat] two modifications of this handheld AT rocket launcher: for firing from the shoulder or bipod and served by one person, and a mounted version (Fig. 8 [figure not reproduced]) equipped with a tripod mounting and served by a team of two persons. It fires a rocket-assisted projectile.

In **Israel** two handheld AT weapons were created [sozdat] in the early 1980's, the B-300 and the Picket. The first model's design is similar to the French LRAC 89 handheld AT rocket launcher. The foreign press notes that the Picket missile launcher is characterized by high firing accuracy, achieved by equipping the missile with an inertial system helping to keep it on the line of sight during flight.

There are handheld AT rocket launchers of own development [razrabotka] in armies of Belgium (Blindicide RL-83) and Spain (C-90-C). In recent years a number of NATO countries have displayed a trend toward creating [sozdaniye]off-route AT mines based on the handheld AT rocket launcher. Launchers also are being developed [razrabatyvatsya] which, in addition to having 2-4 rocket launchers (on tripods), are equipped with a television camera connected by fiber-optic cable with the panel of an operator under cover.



6904

## Portable Field Artillery Computers

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[Article by Col F. Dmitriyev, candidate of technical sciences]

[Text] Foreign military specialists emphasize that the development [razrabotka] and introduction to the troops of precision guided weapons does not in any way signify a reduction of the role of field tube and rocket artillery as well as mortars in modern combat. As before, the primary mission of these weapons remains the engagement (with maximum speed) of detected targets in accordance with the sequence given by the fire plan and with minimum ammunition expenditure. Special significance in field artillery actions is attached to surprise in delivering a fire assault and concentrating the fire of several subunits on the most important targets.

Meanwhile according to the foreign press such features of modern combat actions as the threat of the enemy's possible use of nuclear weapons, the swiftness of change in the battlefield situation, the sharp increase in number

of targets (basically mobile) and increased capabilities in the area of counterbattery fire lead to the need for broad dispersal of artillery combat formations and a frequent change in its firing positions. Attention also is directed to the need for a fundamental change in means and methods of control and to the introduction of various classes of the latest electronic computers to field artillery.

Western military specialists believe that on the one hand modern artillery remains a weapon of group action and has to effectively engage a large number of targets (including moving targets), which requires a sharp improvement in the accuracy of high intensity, surprise fire; on the other hand, it must possess the capability of acting in coordination from dispersed combat formations. Improvements made to the artillery systems themselves do not allow this contradiction to be completely eliminated. This is why foreign specialists are attempting to solve this problem through the integrated improvement of means and methods of intelligence, command and control, and communications. It is believed, however, that at the present time the best prospects for broadening tactical capabilities of field artillery are opened up by using the digital electronic computers in existence and under development [razrabatyvat] for automated solution of problems of topographic survey of firing positions, selected targets, observation posts and reference points; for calculating initial data for registration; and for inputting corrections based on results of a ranging round to open up fire for effect.

The first equipment for this purpose entered the inventory of ground forces of a number of capitalist countries back in the early 1960's. Due to relatively large size, weight and power consumption, however, it was mandatory to provide separate transportation for it and it could be in the inventory of no lower than the battalion.

Successes in miniaturizing computers in the 1970's sharply expanded the opportunities for their military use, including for field artillery. Having small size and weight, they possess rather broad capabilities. They can be used to outfit batteries, platoons, fire sections and even individual gun crews. Meanwhile the foreign press emphasizes that using portable computers directly in fire subunits is envisaged only as a supplementary means to automated fire control systems which are being developed [razvitiye] in parallel. Since the mid-1970's the development [razrabotka] of portable field artillery computers has been carried out in the majority of developed capitalist countries, but most intensively in Great Britain and France.

According to their weight-size characteristics, modern portable computers are divided in the foreign press into hand portable (weighing up to 3 kg), man portable (10-15 kg) and transportable (up to 35 kg). Their development [razrabotka] is based on different models of civilian pocket calculators and personal computers. They differ from each other in memory capacity and software capabilities.

It has been determined by general requirements for storage devices that hand portable computers must provide for input and storage of data on the coordinates of 6-9 guns, 4-20 artillery forward observers, 10-20 reference points, 10 no-fire areas (in which friendly troops are located), and 10-100 targets. In addition, to calculate firing data and corrections it is necessary to input and store in the computer values for projectile muzzle velocity and charge temperature, information about types of projectiles being used, as well as a set of information from the standard NATO weather report.

Hand portable computers basically use two kinds of software to solve fire problems. The first, used chiefly in computers of earlier development [razrabotka], consists of data stored in memory from firing tables of a specific artillery weapon system calculated for standard weather conditions as well as correction factors to be added in accordance with conditions existing at the moment of fire. With this software the hand portable computer represents an automated device for retrieving necessary statistical data from firing tables and corrections thereto, with performance of the simplest mathematical operations. It is believed that the accuracy of this method cannot be considerably higher than with manual preparation of firing data using a map and plotting board; using the computer with a weapon of another caliber or type requires a change in software.

The capabilities of digital computers are used to a fuller extent with the second kind of software. In this case the computer is used to mathematically model the process of flight of the projectile (or more accurately of its center of mass) with consideration of specific initial conditions. Such modeling is done by describing the projectile's movement along a trajectory as a function of time using a set of differential equations. By integrating these equations over time, the computer determines the projectile's coordinates at any moment after it is fired. This permits the computer to figure its deflection from the target, determine necessary correction and fuze setting values, and so on even before the moment the projectile actually impacts. The potential accuracy of this method depends on the accuracy of determining initial conditions and according to the western press it can be so high that it permits opening fire for effect with registration by a single round even without awaiting determination of the ranging round's burst coordinates.

The principal deficiency of the method described is the considerable time needed for the computer to perform calculations when firing to long ranges; according to NATO requirements this should not exceed 25 percent of the projectile's flight time to the target. But the rates of increase in speed as computers improve permit foreign specialists to believe that this deficiency will be eliminated in the next few years.

The software and memory capacity of man portable and transportable computers are designed for accomplishing a number of secondary tasks of fire planning, coordination with other combat arms, logistical support and so

on. In addition, they usually automatically encode and decode reports transmitted over radio lines, they have more advanced displays, and their data input/output devices permit using the computer as a personal computer for solving nonstandard problems.

The foreign press describes the following procedure for tactical employment of portable computers. Coordinates of guns (weapon subunits), targets, observation posts (fire spotters), reference points and no-fire areas are read from a topographic map or navigation equipment and put into the computer's main storage. Data on the location of these objects can be input both in rectangular and polar systems of coordinates and the computer converts them into linear values with an accuracy to several meters depending on the weapon system to which they are giving fire support. Then initial data are input for performing ballistic calculations; these usually include the projectile's muzzle velocity, charge temperature, weight category and type of projectile (fragmentation, high explosive, smoke, tracer and others), as well as NATO standard weather data (wind direction and velocity, air temperature, and pressure).

The computer solves practically any standard topographic problems (conversion of coordinate systems, calculation of corrections for magnetic declination and so on) while preparing to calculate firing data under supplementary programs. After this, data are computed for the ranging round which include the requisite azimuth and quadrant elevation of the gun as well as the range of fire (the computer display screen usually shows the charge number, projectile category and flight time). If necessary, it computes such correction data as displacement of the mean point of aim when fire is adjusted by a ground forward observer or the fire-control grid correction of targets when spotting from the air.

After determining and inputting necessary corrections calculated from results of the ranging round, the computer outputs firing data for each subunit piece for engaging a target by salvo or volley fire or by placement of fire barriers. In addition, in this phase certain types of computers calculate the requisite minimum ammunition expenditure for accomplishing a specific fire mission. Some of the most advanced computers have provisions for determining a future position of aim used in firing against moving targets.

To simplify the process of training gun crew members to work with a portable computer as well as to ensure maximum exclusion of errors when acting under tense combat conditions, the computer program displays instructive commands for the sequence of operator actions and an error symbol when there is incorrect data input or when the wrong control panel key is pressed. Tests can be input and control data displayed to check computer serviceability.

The British Morzen device (Fig. 1 [figure not reproduced]) intended for use with 81-mm mortars is a typical example of a portable computer. Over 500 sets were delivered to the British Army. The commercial HP41CV microcalculator of the American firm of Hewlett-Packard was taken as the basis for its development [razrabotka]. In addition to its operating characteristics (improved reliability, stability to temperature and mechanical stresses), a distinguishing feature of the military version of the portable computer is the ease of changing software, which permits using this device with any mortar system. Its dimensions are 200x118x58 mm and it weighs 625 g.

The foreign press emphasizes that the accuracy of azimuth and quadrant elevation calculations performed by the Morzen computer is plus or minus one mil. Topographic calculations are performed based on data of a reference grid input to the computer and based on corresponding coordinates of 10 firing positions, 10 observation posts and 58 targets. The computer calculates firing data for two firing positions simultaneously. In the presence of precisely surveyed reference points the location of targets, observation posts and firing positions is computed in the topographic map grid system, but there is also the possibility of performing such calculations in an arbitrary system of coordinates. Special programs are provided for fast conversion of firing data to engage targets with known coordinates from new firing positions; for organization of fire by spotting the bursts of smoke-generating and illuminating ammunition; as well as for speeding up the calculation of corrections based on data of laser rangefinders used at observation posts. Foreign specialists assert that as a result there is the possibility of spotting fire on several targets by taking account of the data of one ranging round.

Weather data are input to the computer and used in calculations to increase first round accuracy. At the operator's desire the display screen can depict at any moment the range and azimuth of any object on which there are data in memory. The problem-solving process is not interrupted in so doing. The program also automatically signals an operator's incorrect actions.

A quartz clock is built into the computer which in particular permits keeping a reverse count of time remaining to H hour or from the moment a projectile is fired until it impacts. The power battery, which can be easily replaced under field conditions, supports the device's operation for 8 hours a day for a period of 9 months.

Based on operating experience of the Morzen device with the troops, British specialists developed [razrabotat] the Hansen device for preparing firing data for tube field artillery and Lance operational-tactical missiles. It can provide necessary data to eight guns simultaneously. The portable Hansen computer calculates the azimuth to

a target 6 seconds after it is detected. Within the next 6 seconds it calculates and displays data of the gun quadrant elevation, the projectile's flight time and the required charge.

The American firm of Litton Data Systems has created [sozdat] and already is producing the FCC (Fire Control Calculator, Fig. 2 [figure not reproduced]) portable computer intended for use at the artillery battery level. It is used to obtain necessary data for preparation and conduct of fire from howitzers, guns or mortars. The memory can store information about the location of up to 18 friendly guns, up to 12 forward observers and up to 58 targets. The computer (it weighs around 1 kg) can be used as a computing device in the field artillery fire control system.

In France the firm of Thomson-Brandt is producing the portable ATAC computer (Fig. 3 [figure not reproduced]), also intended for calculating and outputting data necessary when firing field artillery pieces. The coordinates of 9 friendly pieces, 20 forward observers and up to 99 targets as well as weather data, projectile muzzle velocity and charge temperature can be input to its memory. The computer can be linked with similar computers by radio or wire communications. There is a built-in control apparatus. The ATAC's dimensions are 245x165x85 mm and it weighs around 3 kg (with power source).

Individual mortar batteries in the Italian Army are outfitted with the portable CMB-8 computer, to which a printer can be added.

The French TIRAC (designated the Cadet in the Army), which is used both independently and as part of the Atila II automated field artillery fire control system, has found widest use among portable computers at the present time. Initially it was planned to deliver 150 such computers to French troops for outfitting 155-mm gun batteries and 120-mm mortar platoons.

Data produced by the computer are transmitted to gun crews in digital form by wire and radio communications and read out on remote displays.

The western press notes that the primary distinction of the French Cadet computer from the British Morzen is the fact that it uses the method of calculating a projectile's impact point by integrating differential equations, which increases the accuracy of computations and, most important, permits using the computer with any field artillery weapon system.

In the opinion of foreign specialists, the British Quickfire (Fig. 4 [figure not reproduced]), created [sozdat] by the firm of Marconi, is one of the modern portable computers for field artillery fire control. Its dimensions are 316x290x71 mm and it weighs around 6 kg. The computer software uses the method of modeling projectile flight trajectory with consideration of a number of initial conditions to calculate fire preparation data. Versatility of the computer's use is provided by replacement of selected printed circuit boards: use by forward observers, at control posts of artillery batteries or battalions, and by combat teams of weapon subunits. The coordinates of around 100 targets can be input to memory.

The front panel of the Quickfire computer has liquid crystal displays for read-out of necessary data. The organic means of wire and radio communications which are used support the automatic transmission of data in digital form in a burst mode, which increases the antijam protection of communications lines.

The external view of a typical Milipack transportable computer of Canadian development [razrabotka] (weight 32 kg) is shown in Fig. 5 [figure not reproduced]. It provides not only for calculation of firing data, but also planning of the fire of several subunits, encryption of transmitted data and input of corrections based on sound ranging reconnaissance data. Calculation is performed by the method of integrating differential ballistic equations; in addition to the aforementioned initial data, the computer stores up to 12 values of nonstandard projectile muzzle velocities which take account of the extent of gun bore wear.

The foreign press emphasizes the convenience of using the computer display (it is possible to read out data from it with any natural outside illumination), the gear's high reliability (mean time between failures of at least 1,000 hours and mean troubleshooting time 30 minutes), and high storage capacity (up to 30,000 16-bit words). It is noted that the Milipack computer can be used for preparing data to conduct fire from any NATO field artillery weapon system.

The computer is powered from the on-board power supply of transport equipment with power consumption not exceeding 75 watts.

Israeli Army artillery batteries are equipped with the David computer (weight 27 kg, Fig. 6 [figure not reproduced]) installed in field artillery fire control vehicles. It can output firing data for six pieces simultaneously.

Judging from foreign press reports, the following trends are presently seen in the development [razvitiye] of portable field artillery computers. First of all speed is being increased to a degree ensuring computation and output of data to gun crews for opening fire for effect based on the first ranging round even before the round impacts in the target area. Secondly, special emphasis is placed on automating the input of initial data to the computer and providing for comparative analysis of information coming both from existing equipment of artillery forward observers and from future reconnaissance equipment, particularly drones, which sharply increases requirements for capacity and speed of storage devices. Western specialists link the time periods for the

appearance of such computers with completion of work to create [sozdaniye] the technology for mass production of very large and very high speed integrated circuits. Thirdly, there is emphasis on a further improvement in computing capabilities of portable computers, on an increase in their accuracy and versatility of operation, and on an expansion in the range of tasks accomplished by developing [razrabotka] and mastering new software. Meanwhile the foreign press emphasizes that even in the future portable computers will remain only a supplementary means with respect to the field artillery automated fire control system.



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**Japanese Air Force**
*18010069i Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 37-44*

[Article by Col V. Samsonov]

[Text] Being an independent branch of the Armed Forces, the Japanese Air Force is called upon to accomplish the following primary missions: air defense, air support to ground and naval forces, aerial reconnaissance, air movement and landing of troops and cargoes. Considering the important role given the Air Force in aggressive plans of Japanese militarism, the country's military leadership places great emphasis on building up its combat might. This is done above all by outfitting units and subunits with the latest aviation equipment and weapons. To this end the production of modern F-15J combat aircraft, Sidewinder AIM-9P and AIM-9L air-to-air guided missiles, and CH-47 helicopters has unfolded in Japan in recent years with active U.S. assistance. Development [razrabotka] has been completed and series production has begun on Type 81 short-range surface-to-air missile [SAM] systems, T-4 jet trainers, ASM-1 air-to-ship guided missiles, new fixed and mobile 3D radars and so on. Preparations are being completed at the present time to begin production of Patriot SAM systems at Japanese enterprises under American license.

All this as well as continuing weapon deliveries from the United States permitted the Japanese leadership to significantly strengthen its Air Force. In particular, over the last five years the Air Force has received some 160 combat and auxiliary aircraft including over 90 F-15J fighters, 20 F-1 tactical fighters, 8 Hawkeye E-2C airborne early warning and control aircraft, 6 C-130H transports and other aviation equipment. Because of this four fighter squadrons (201st, 202d, 203d and 204th) were re-equipped with F-15J's, three squadrons (3d, 6th and 8th) completed fitting out with F-1 fighter-bombers, the 601st Airborne Early Warning and Control Squadron (Hawkeye E-2C aircraft) was activated, and the 401st Transport Squadron began being re-equipped with C-130H aircraft. The first composite SAM-AAA air defense battalion was activated with Type 81 short-range SAM systems as well as the Stinger portable SAM system and Vulcan AAA mounts. In addition, the Air Force continued to receive 3D fixed (J/FPS-1 and -2) and mobile (J/TPS-100 and -101) radars of Japanese manufacture to replace obsolete American radars (AN/FPS-6 and -66) in the Air Force radiotechnical troops. Seven separate mobile radar companies also were formed. Work of modernizing the BADGE air defense automated control system is in the final phase.

The organization, composition, combat training and outlook for development [razvitiye] of the Japanese Air Force are given below from foreign press data.

**ORGANIZATION AND COMPOSITION.** Direction of the Air Force is exercised by a commander in chief who at the same time is chief of staff. The principal forces and resources of the Air Force are brought together in four commands: tactical air, air training, air technical training and logistics. In addition there are several units and establishments of central subordination (Air Force organizational structure is shown in Fig. 1).

The **Tactical Air Command** is an operational Air Force formation assigned to accomplish the primary missions. Its headquarters is located at Fuchu (near Tokyo). Organizationally the Tactical Air Command includes three air sectors (Northern, Central and Western) as well as the Southwestern Composite Air Wing and separate units and subunits.

The *air sector* is an operational Air Force unit intended to accomplish missions assigned the Tactical Air Command within limits of its established zone of responsibility. The zone of responsibility of the Northern Air Sector (headquarters at Misawa Air Base) includes the island of Hokkaido and the northern part of the island of Honshu; that of the Central Air Sector (headquarters at Iruma) is central Honshu and part of Shikoku Island; and that of the Western (headquarters at Kasuga) includes the southwestern parts of Honshu and Shikoku Island as well as the island of Kyushu. Sector zones of responsibility also include sea areas contiguous with the islands.

Organizationally each air sector includes two fighter wings, up to two Nike-J SAM battalions, an acquisition and control wing, as well as separate combat support units and subunits. In addition it is planned to activate two composite SAM-AAA battalions for the air defense of air bases, radar stations and Nike-J (and later Patriot) SAM positions against enemy low-altitude air strikes in each air sector during implementation of the latest program for organizational development of the Japanese Armed Forces (1986-1990).

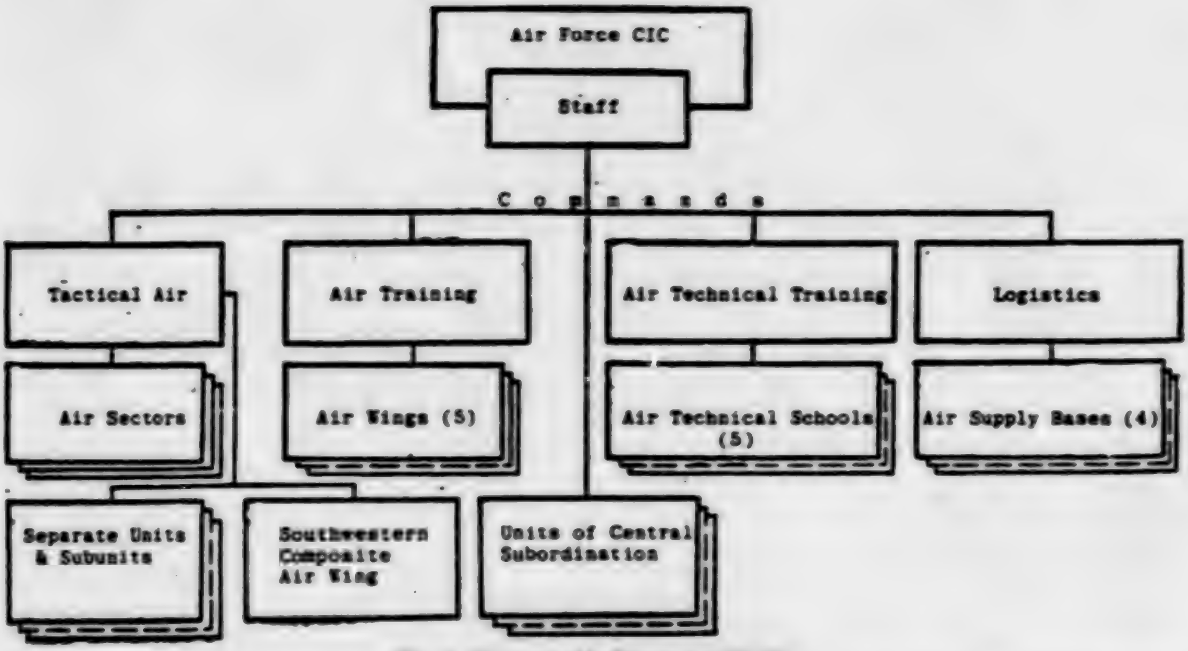


**Fig. 1. Japanese Air Force organization**

It is planned to include in such battalions three different types of air defense batteries (for air bases, radar stations and SAM positions) differing from each other in organic weapons. For example, the air base air defense battery has two Type 81 short-range SAM systems, 24 Stinger portable SAM systems and 16 Vulcan towed AAA mounts. Radar station air defense batteries have two Type 81 SAM systems, 24 Stingers and 6 Vulcans; the SAM position air defense battery has only Stinger SAM systems (24 launchers) and Vulcan mounts (6). It is reported that the number and type of batteries in each battalion will depend on the missions assigned it. For example, the first composite SAM-AAA battalion activated in late 1986 in the Northern Air Sector (headquarters at Chitose) has two air base air defense batteries (Chitose and Misawa) and one radar station air defense battery (Tobetsu), which have 6 Type 81 SAM systems, 72 Stinger SAM systems and 38 Vulcan mounts.

The fighter wing is the basic tactical air unit of the Air Force. It includes three groups: fighter, aviation engineer, and airfield maintenance. As a rule the fighter air group has two squadrons, each of which has 18-24 combat aircraft and several trainers.

The Nike-J SAM battalion is the basic tactical SAM unit of the Air Force. Organizationally it includes one headquarters battery, 2-4 weapon batteries and one technical battery. Each weapon battery has nine Nike-J SAM launchers (Japanese version of the American Nike-Hercules SAM, see color insert [color insert not reproduced]).

The acquisition and control wing performs radar detection, identification of airborne targets and guidance of fighter-interceptors to them. The wing includes from 9 to 11 radar companies which have fixed and mobile radars. A company deploys one radar station.

The *Southwestern Composite Air Wing* (headquarters at Naha Air Base) is a specified Air Force formation. Its zone of responsibility includes the Ryukyu Islands and contiguous water areas. The wing's principal installations are located on the island of Okinawa. It has the 83d Fighter Group (F-4EJ aircraft), an acquisition and control group (five radar companies, of which four are outfitted with fixed radars and one with mobile radars), as well as the 5th Nike-J SAM Battalion.

*Separate units and subunits* of the Tactical Air Command include an airborne early warning group (Misawa Air Base), an aerial reconnaissance group (Hyakuri) and two separate air squadrons (aggressor and headquarters).

The airborne early warning group initially was included as a temporary formation in the Northern Air Sector, where comprehensive tests were conducted of the capabilities of an airborne early warning system created [sozdavat] on the basis of the Hawkeye E-2C aircraft, and where its organizational structure was adjusted. All these measures esesntially have been completed. The airborne early warning group includes a headquarters, the 601st Airborne Early Warning Squadron (eight Hawkeye E-2C aircraft), and support subunits. It has a total of 350 personnel of whom 130 are in the 601st Squadron. In the spring of 1986 the group was resubordinated directly to the CIC of the Tactical Air Command and began performing alert duty. The number of its aircraft is to be increased to twelve in the future.

The aerial reconnaissance group is intended for conducting aerial reconnaissance for all branches of the Armed Forces. Organizationally it includes a headquarters, the 501st Reconnaissance Wing, and sections for processing and interpreting photographic materials and for servicing aircraft on-board reconnaissance equipment. It has 14 RF-4E aircraft purchased in the United States (Fig. 2 [figure not reproduced]).

The aggressor air wing was activated in December 1981. It has T-2 combat trainers (the two-seat version of the F-1 tactical fighter, see color insert [color insert not reproduced]) and several T-33A trainers. It is intended for denoting the operations of enemy aircraft during combat training of other Air Force units and subunits. Its flight personnel have a high level of flight and tactical training.

The headquarters wing is outfitted with B-65 light liaison aircraft, several transports (YS-11), trainers (T-33A) and EW aircraft (EC-1, YS-11E). In addition it has T-33's fitted with special equipment for active and passive jamming. The latter three types of aircraft are actively used in missions of training flight personnel and the crews of ground command posts for combat actions under conditions of the use of EW equipment.

According to foreign press reports, the Japanese Air Force Tactical Air Command presently has seven fighter wings in which there are 13 squadrons of tactical aviation (fighter squadrons and tactical fighter squadrons); six SAM battalions in which there are 19 Nike-J SAM batteries; three acquisition and control wings and one acquisition and control group; as well as other units and subunits. The command's composition is given in more detail in the table.

The **air training command** trains flight personnel for the Air Force, Navy and Army aviation. It includes a theoretical training squadron, three training wings (11th, 12th and 13th) and two combat training wings (1st and 4th) as well as several support subunits.

The theoretical training squadron (Bofu Air Base) is for general theoretical and special technical training of cadets over a two year period before the beginning of flight training.

Initial flight training of students and cadets is done in piston-engine T-3 aircraft in the 11th and 12th training wings (Shijuhama and Bofu air bases). Training lasts around eight months (flying hours per person average 70). They undergo basic training first in T-1 jet aircraft in the 13th Training Wing (Ashiya) and then in T-33 aircraft in the 1st Training Wing (Hamamatsu). Flying hours are 84 in the T-1 and 100 in the T-33. Training in each of the wings lasts around seven months.

The training and combat training wings are similar in structure to combat wings. They have a total of 10 squadrons which have some 300 training and combat training aircraft including over 50 T-2's, 50 T-3's, 120 T-33's and 50 T-1's. In addition there are 60 T-33's and 12 T-2's in the Tactical Air Command and units of central subordination.

The **air technical training command** is responsible for training engineer-technical personnel and other specialists for air, SAM, radiotechnical and airfield-technical units and subunits. It has five schools, two of which are located in Hamamatsu and the others in Ashiya, Kumagaya and Komaki.

The **logistics command** handles planning, purchases and distribution of combat equipment, weapons and supply items and arranges for their receipt from industry and their accounting, storage and maintenance. It consists of a headquarters (in Tokyo) and four supply bases (1st, 2d, 3d and 4th), each of which organizationally includes a headquarters and central and peripheral depots. The headquarters and central depot of the 1st Base are located in Kisarazu, the 2d in Kagamihara and the 3d and 4th in Sayama.

**Units of central subordination.** They include three air wings: transport, search and rescue, and test.

The *transport wing* (headquarters in Miho) is intended for moving troops and cargo as well as for landing (dropping) airborne assault forces. It includes three transport groups (1st, 2d and 3d), each of which has a headquarters, one transport squadron (401st, 402d and 403d at Komaki, Iruma and Miho air bases respectively), aviation engineer support subunits and airfield maintenance subunits. In addition to primary missions, the 3d Transport Group is assigned missions of training transport aviation flight personnel. The wing has 28 C-1's (Fig. 3 [figure not reproduced]), 10 YS-11's and 6 C-130's (deliveries of the latter aircraft are continuing).

The *search and rescue wing* searches for and rescues aircraft and helicopter crews as well as the civilian populace during natural disasters. It includes a headquarters, search and rescue squadron (Iruma Air Base), training squadron (Komaki), and aviation engineering support subunits. The search anad rescue squadron has 11 rescue detachments distributed evenly over Japanese territory. Each detachment has two MU-2 aircraft and two or three KV-107 helicopters. The wing has a total of 29 MU-2's and 33 KV-107's.

The *test wing* (headquarters at Gifu Air Base) is intended for conducting flight tests of prototypes and series models of aircraft, aircraft weapons, electronics and special equipment, and it draws up recommendations for their operation, piloting and tactical employment. Organizationally it includes a headquarters, test squadron, aviation engineering support and airfield maintenance subunits, and subunits for generalizing and analyzing test data. The wing has up to 25 aircraft of various types (F-15J, F-4EJ, F-104J, T-2, C-1, F-1, T-4, T-1, T-3, T-33 and others).

**Tactical Air Command Composition**

| Large Air Units | Small Air Units | Air Subunits | Basic Armament | Unit Hq Location |
|---|---|---|---|---|
| Northern Air Sector | 2d Fighter [Ftr] Wing | 201st Air Defense [AD] Ftr Squadron [Sq] | F-15J | Chitose |
| | | 203d AD Ftr Sq | F-15J | |
| | 3d Ftr Wing | 3d Tactical [Tac] Ftr Sq | F-1 | Misawa |
| | | 8th Tac Ftr Sq | F-1 | |
| | 3d SAM Bn | 9th, 10th, 11th SAM batteries | Nike-J SAM | Chitose |
| | 6th SAM Bn | 20th, 21st SAM batteries | Nike-J SAM | Misawa |
| | 1st Composite SAM-AAA Bn | Three batteries | Type 81 and Stinger SAM systems | Chitose |
| | | | Vulcan AAA | |
| | Acquisition and control wing | Nine radar companies | Fixed radars | Misawa |
| | | Two radar companies | Mobile radars | |
| Central Air Sector | 6th Ftr Wing | 303d AD Ftr Sq* | F-4EJ | Komatsu |
| | | 306th AD Ftr Sq | F-4EJ | |
| | 7th Ftr Wing | 204th AD Ftr Sq | F-15J | Hyakuri |
| | | 305th AD Ftr Sq | F-4EJ | |
| | 1st SAM Bn | 1st, 2d, 3d, 4th SAM batteries | Nike-J SAM | Iruma |
| | 4th SAM Bn | 12th, 13th, 14th SAM batteries | Nike-J SAM | Gifu |
| | Acquisition and control wing | Eight radar companies | Fixed radars | Iruma |
| | | Two radar companies | Mobile radars | |
| Western Air Sector | 5th Ftr Wing | 202d AD Ftr Sq | F-15J | Nyutabaru |
| | | 301st AD Ftr Sq | F-4EJ | |
| | 8th Ftr Wing | 304th AD Ftr Sq | F-4EJ | Tsuiki |
| | | 6th Tac Ftr Sq | F-1 | |
| | 2d SAM Bn | 5th, 6th, 7th, 8th SAM batteries | Nike-J SAM | Kasuga |
| | Acquisition and control wing | Seven radar companies | Fixed radars | Kasuga |
| | | Two radar companies | Mobile radars | |

**Tactical Air Command Composition (Continued)**

| Large Air Units | Small Air Units | Air Subunits | Basic Armament | Unit Hq Location |
|---|---|---|---|---|
| Southwestern Composite Air Wing | 83d Ftr Group | 302d AD Ftr Sq | F-4EJ | Naha |
| | 5th SAM Bn | 17th, 18th, 19th SAM batteries | Nike-J SAM | Naha |
| | Acquisition and control group | Four radar companies | Fixed radars | Naha |
| | | One radar company | Mobile radars | |
| | Separate Airborne Early Warning Group | 601st Airborne EW Sq | E-2C | Misawa |
| | Sep Aerial Recon Grp | 501st Aerial Recon Squadron | RF-4E | Hyakuri |
| | — | Headquarters Sq | B-65, YS-11, EC-1, T-33 | Iruma |
| | — | Aggressor Sq | T-2, T-33 | Nyutabaru |

Key:
*Began being re-equipped with F-15J aircraft.

According to foreign press data, the Japanese Air Force has a total of over 400 combat and combat training aircraft, 44 transport aircraft, around 300 training aircraft, almost 80 auxiliary aircraft and helicopters, as well as 180 Nike-J SAM launchers.

**COMBAT TRAINING.** The set of measures taken by the Japanese command to build up tactical capabilities of the Air Force sets aside an important place for combat training of large and small units and subunits. This training is aimed at maintaining high combat readiness and improving their combat effectiveness. It is also conducted in accordance with annual plans drawn up by the Japanese Air Force staff in coordination with the Headquarters, U.S. 5th Air Force (Yokota).

The basic forms of combat training are daily training, command and staff and tactical flying exercises and practices conducted both independently and in coordination with American aviation stationed in the Western Pacific.

In the assessment of foreign military specialists, the largest Japanese Air Force combat training activities are considered to be the final Air Force exercises, Japanese-American command and staff exercises, the Cope North tactical flying exercises, tactical flying exercises under the DACT (Dissimilar Air Combat Training) program as well as joint exercises of search and rescue subunits. In addition there are systematic Japanese-American tactical flying practices to intercept B-52 strategic bombers under ECM conditions as well as tactical flying practices for crews of fighter aviation in the vicinity of the islands of Okinawa and Hokkaido. Each year the Japanese Air Force independently organizes a considerable number of other combat training activities including competition exercises of air subunits of the tactical air command and transport wing.

Final exercises of the Japanese Air Force (codename Soen) are held annually, usually during September-October. Their objective is to check the combat readiness of Air Force units and subunits. Major forces are included in them. For example, in 1986 some 31,000 persons, 380 tactical and auxiliary aircraft and up to 20 ships and vessels took part in the final exercise held jointly with the U.S. 5th Air Force. A broad range of missions was practiced during the exercise for placing units in higher states of combat readiness, for operational deployment, repelling air strikes, isolating a combat zone and aerial reconnaissance. Special attention was given to practicing coordination with the Japanese Navy staff in organizing air defense of ship forces and isolating their area of combat operations.

A Japanese-American command and staff exercise also was held for the first time within the framework of this exercise during which problems of coordination of

American and Japanese air units in accomplishing various missions were practiced. Previously similar Air Force command and staff exercises were held as separate activities.

The basic objective of the quarterly Japanese-American Cope North tactical flying exercises is to practice joint combat actions in accomplishing missions of air defense of installations and troop groupings on the territory of Japan, actions in delivering strikes against ground and sea (waterborne) targets, as well as control of Japanese and American aviation using E-3B and E-2C airborne early warning and control aircraft. As a rule one or two air bases and the combat training zones of one of the three air sectors are involved in the Cope North exercise. Most often Chitose and Misawa air bases are chosen in the northern air sector, Komatsu in the central, Nyutabaru, Tsuiki and Iwakuni in the western, and Naha and Kadena in the Okinawa area. The exercise lasts 5-6 days. All Japanese Air Force tactical air subunits take part in the exercises in turn; on the American side crews of the 18th Tactical Fighter Wing (Kadena Air Base) are used most often for them. The composition of participants from the American side is gradually expanding. For example, subunits of the U.S. Marine 1st Aircraft Wing (Iwakuni Air Base) have been periodically included since the early 1980's, and F-16 aircraft from the USAF 432d Tactical Fighter Wing (Misawa) have been included since December 1985. The western press notes that during these tactical flying exercises more and more attention is given to practicing tactical procedures for delivering strikes against ground and sea targets and skills in conducting combat actions under EW conditions.

In addition, each year seven or eight Japanese-American tactical flying exercises (lasting up to 5 days) are conducted in various parts of the country to practice group air combat between different types of aircraft under the DACT program. Ten or twelve aircraft take part in each of them, including 4-6 American aircraft (usually from the USAF 18th and 432d tactical air wings and the U.S. Marine 1st Aircraft Wing).

Special tactical flying practices have been held regularly since August 1982 for the purpose of giving Japanese pilots practice in intercepting enemy bombers under conditions of extensive use of EW equipment. American B-52 strategic bombers play the role of EW platforms and actively jam the airborne radars of fighters making the intercept. Twelve such practices were held in 1985; all were conducted in the Japanese Air Force combat training zone west of Kyushu Island.

In addition to those mentioned above, there are weekly tactical flying practices together with American aviation to improve the flight personnel's skills in making intercepts and conducting group air combat (from a pair to a flight of aircraft on each side). Such a practice lasts for one or two flight sections (6 hours each).

In addition to joint Japanese-American activities the Japanese Air Force command regularly arranges tactical flying practices of air and SAM units and subunits both independently and in coordination with the country's Army and Navy.

Annual competitive exercises of tactical air command subunits conducted since 1960 are scheduled fighter aviation combat training activities. During these exercises the best air units and subunits are identified and their combat training experience is studied. Teams from all tactical air command units as well as from training squadrons of the 4th Fighter Wing of the Air Training Command, teams from Nike-J SAM battalions, and teams of operators of radar stations and ground controlled intercept stations take part in such competition exercises.

Each air team has four tactical aircraft and up to 20 flight and technical personnel. Komatsu Air Base; one of the largest Air Force combat training zones located over the Sea of Japan northwest of Komatsu; as well as the Amagamori (northern part of Honshu Island) and Shimamatsu (Hokkaido Island) air ranges usually are used for the competitions. Teams compete in performing intercepts of airborne targets, conducting group air combat, and delivering strikes against ground and sea targets including with practice bombing and strafing.

The foreign press notes that the Japanese Air Force has broad tactical capabilities and its crews have a high level of professional training which is maintained by the entire system of daily combat training and checked during the aforementioned various exercises, competitions and other activities. A fighter pilot's average annual flying hours are around 145.

**AIR FORCE DEVELOPMENT** [razvitiye]. In accordance with the five-year program for organizational development of the Japanese Armed Forces (1986-1990), it is planned to carry out a further build-up of Air Force might chiefly by deliveries of modern aircraft and SAM systems, modernization of aviation equipment and armament, and an improvement in the air space monitoring and command and control system.

The organizational development program plans continued deliveries of F-15J aircraft (Fig. 4 [figure not reproduced]) to the country's Air Force which have occurred since 1982 to bring their overall number to 187 by the end of 1990. By this time it is planned to re-equip another three squadrons (303d, 305th and 304th) with F-15 fighters. Most of the F-4EJ aircraft in the inventory (there are now 129), particularly 91 fighters, are to be modernized to extend their service life to the end of the 1990's, and 17 are to be refitted as reconnaissance aircraft.

In early 1984 it was decided to adopt the American Patriot SAM systems in the Air Force and use them to re-equip all six Nike-J SAM battalions. Beginning in

fiscal year 1986 it is planned to allocate funds annually to purchase four Patriot SAM systems. They will begin to arrive in the Air Force in 1988. The first two training batteries are to be activated in 1989 and SAM battalions will begin to be re-equipped in 1990 (one battalion annually).

The Air Force organizational development program also provides for continuing deliveries of C-130H transports from the United States (for the transport wing's 401st Squadron), the number of which is to be taken to 14 by the end of 1990.

It is planned to expand capabilities of the air space monitoring system by increasing the number of E-2C Hawkeye airborne early warning aircraft to 12, which in the opinion of Japanese specialists will permit shifting to around-the-clock alert duty. In addition, by 1989 it is planned to complete modernization of the BADGE automated system for control of air defense forces and resources, as a result of which there will be a considerable increase in the automation level of the processes of collecting and processing the air situation data needed for controlling active air defense forces. The refitting of air defense radar stations with modern 3D radars of Japanese manufacture will continue.

Other measures also are being taken aimed at further developing [razvitiye] the country's Air Force. In particular, R&D is continuing for selection of a new tactical aircraft which is to replace the F-1 tactical fighter in the 1990's, and there is an ongoing study of the advisability of accepting tanker aircraft and E-3 airborne early warning and control aircraft into the Air Force inventory.



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## Air-Launched Missile Motors

*18010069j Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 45-51*

[Article by Col Yu. Belyayev, candidate of technical sciences]

[Text] The capitalist countries' arsenal of air-launched missile weapons, considered by western military specialists as the basic kind of aircraft and helicopter armament, presently includes both tactical and strategic models of free-flight rockets (NAR); guided missiles (UR) of various classes including antiradar, antitank (PTUR) and antiship (PKR); as well as cruise missiles (KR). In addition, according to the American classification any air-to-ground guided weapon (such as guided bombs or clusters) equipped with a motor also is included among guided missiles and is designated AGM (Air-to-Ground Missile).

The propulsion unit is an important element of air-launched missiles determining their range of fire, altitude of employment and maneuverability. Propulsion units use solid-propellant rocket motors (RDTT), turbojet motors (TRD), turbofan motors (TRDD), and liquid-propellant rocket motors (ZhRD). In recent years ramjet motors (PVRD) also have begun to be used. Launching or sustainer motors or only sustainer motors may be included in propulsion units depending on conditions of employment and purpose of the missiles.

**Solid-propellant rocket motors** are the most widespread type of motors for air-launched guided missiles of all classes. The interest in them is explained by their simplicity of design and production technology, constant readiness for operation, high reliability, capacity for lengthy storage (because of the rather high stability of solid fuels), characteristics essentially independent of employment altitude, capability of creating [sozdavat] considerable thrust in the launch mode, and accordingly the missile's acceleration to high speeds in a short time. The principal deficiencies of solid-propellant rocket motors are considered to be low specific impulse values (amount of thrust created [sozdavat] by one second's fuel consumption) and difficulty of supporting a long range of fire (it is necessary to increase fuel weight, since fuel and oxidizer must be aboard the missile).

The shape of the fuel charge (the grain) largely depends on the purpose and the motor's operating mode. For example, in motors with a brief mode (such as boosters and the motors of air-to-air free-flight rockets and guided missiles) there must be a large combustion surface area and so fuel charges have inner ducts of varying shape (cylindrical, stellate or slotted). As a rule, end burning charges are used in sustainer motors. Motor dimensions are determined by missile diameter. The motor casing, being at the same time the missile casing, is made of steel or light alloys.

Fuel charges are divided into poured, compacted or extruded according to the manufacturing process. In the majority of cases charges are fastened to the casing using special binders which in addition to giving mechanical strength to the joint prevent a possible chemical interaction of the fuel with casing material.

Depending on missile configuration, motors can have a gas duct (the French AS-30L guided missile), one central nozzle, two lateral nozzles or a combination of the two. The majority of nozzles have a slight expansion ratio, but in the motors of some missiles (Sidewinder, Phoenix) they have a high expansion ratio. To ensure high nozzle reliability their expanding parts are made of carbon-carbonic composition materials and heat resistant inserts are installed in the critical part.

Electrical ignition systems are used in solid-propellant rocket motors. If the motor has launch and sustainer stages with different fuel charges, sustainer stage fuel can be ignited from hot gases from the launch stage. Launch

Fig. 1. American Sidewind .IM-9L air-to-air guided missile (sectional view)

and sustainer stage (booster and sustainer motor) are placed in operation simultaneously (HOT ATGM) or successively (AS-30L). There are two-mode (double-pulse) motors (such as the solid-propellant rocket motor of the American SRAM guided missile, which is switched on a second time just ahead of the target).

Well-known firms and state enterprises are engaged in development [razrabotka] and production of solid-propellant rocket motors for air-launched missiles: Morton Ordnance in Great Britain, Aerospatiale, Thomson, Matra and SEP in France, and Raufoss in Sweden. Design features of the solid-propellant rocket motors of selected models of air-launched missiles of capitalist countries are given below.

The motor of the American Sidewinder AIM-9L air-to-air guided missile (its military designation is Mk 36 Mod 9 and company designation TX-683) occupies more than half of the missile's length (Fig. 1), has a central stellate, three-lobed section duct and nozzle with considerable expansion ratio. The motor casing is aluminum, the nozzle is molded glass phenol, and the fuel charge has phenolic reinforcement. The monoblock charge is ignited from the front end. Motor weight with fuel is around 60 percent of the missile's launch weight.

The propulsion unit of the West German Kormoran antiship missile consists of a sustainer motor with gas duct and two Prades launch boosters situated on both sides of the duct. Compacted fuel charges of the boosters have stellate inner ducts. In one second the boosters impart an acceleration of more than 9 g to the missile. The Ecole-4 sustainer motor with monoblock fuel charge switches on a short time after booster fuel burns out and maintains the missile's cruising flight mode at a speed of Mach 0.9. Fuel combustion occurs from the rear end. Nozzles of the boosters and sustainer motor are separate.

The booster fuel charge of the French Exocet antiship missile has an inner central tubular duct with an irregular contour—radial swallowtail slots.

The motor of the Canadian CRV-7 70-mm rocket is typical of free-flight rockets. Its monoblock fuel charge has an inner cylindrical duct and is armored on the side of the motor housing. The fuel mixture contains 88 percent of ammonium perchlorate, aluminum and iron oxide. The nozzle is made of fiberglass with a graphite insert in the critical section. Fuel ignition is electrical.

Characteristics of solid-propellant motors of air-launched missiles compiled from foreign press materials are given in Table 1.

Modern solid-propellant rocket motors use fuels that are both composite (or heterogeneous) as well as dibasic (colloidal). The first are mechanical mixtures of fuel (65-80 percent) and oxidizer (10-20 percent). Usually they also contain 5-15 percent of high-energy components which increase efficiency (aluminum, magnesium), and up to 10 percent of various additives. Polyurethane, polybutadiene (including HTPB carboxyl-terminated polybutadiene) or their mixture are used as fuel in such propellants, and ammonium perchlorate is primarily used as the oxidizer.

Composite propellants are considered better than dibasic propellants in energy characteristics. For example, the design quantity of specific thrust of "ammonium perchlorate and polyether" type propellant can reach 240 seconds, and with the addition of 15 percent aluminum, 255 seconds. Boron and its compounds (boranes) or beryllium and lithium, which considerably surpass aluminum and magnesium in calorific power, also are used as other high-energy components of composite propellants. For example, the calorific power of beryllium is 15,900, boron is 10,400, diborene around 17,000, pentaborene over 16,000, and lithium 10,300 kcal/kg (as comparison, it is 7,400 kcal/kg for aluminum and 5,930 for magnesium).

Dibasic fuels (also called homogeneous fuels) have a colloidal microstructure and their molecules simultaneously contain hydrocarbons (fuel) and oxygen. Up to 10 percent of various additives (stabilizers and others) also are introduced to them.

In addition to using new high-energy components, western specialists are considering an increase in combustion chamber pressure, a reduction in molecular weight of combustion products, and creation [sozdaniye] of nozzles of new configuration as possible ways to increase the specific impulse of solid propellants. Since 1985 increased attention has been given to polymer fuels

**Table 1 - Characteristics of Solid-Propellant Rocket Motors**

| Designation, Where Used | Fuel / Oxidizer | Length x Diameter, m / Wt (Fuel Wt), kg | Other Characteristics |
|---|---|---|---|
| Mk 60 Mod 0, Phoenix AIM-54C guided missile [GM] | Polybutadiene / Ammonium perchlorate | 1.78x0.38 / 200 | |
| Mk 52 Mod 2, Sparrow AIM-7E GM | Same as above | 1.32x0.2 / 68.5 | Time of operation 2.8 seconds |
| Mk 52 Mod 3 Skyflash GM | Same as above | 1.32x0.2 / 68.5 | Time of operation around 5 seconds |
| Mk 36 Mod 9 (company TX-653) Sidewinder AIM-9L GM | HTPB (R-45) / Ammonium perchlorate | 1.8x0.127 / 45.4 | Cumulative pulse 3630 kg(f), time of operation around 2.2 sec |
| Mk 17 (company SR116-AJ-2), Sidewinder AIM-9J, -9P GM | HTPB (R-45) / Ammonium perchlorate | 1.91x0.127 / 40.4 | |
| Super Matra R.530 GM booster | - | - x0.26 / - | Cumulative pulse 3800 kg(f), time of opera- 2 seconds |
| Super Matra GM sustainer motor | Composite fuel | - x0.26 / - | Cumulative pulse 2500 kg(f), time of opera- 4 seconds |
| Romeo, Magic R.550 GM | Same as above | - x0.157 / - | Cumulative pulse 2650 kg(f), time of operation 1.9 seconds |
| Aspide-1A GM | - | - x0.203 / (54) | Cumulative pulse 12000 kg(f), time of operation around 3.5 sec |
| TU-780 (company), HARM AGM-88A GM | HTPB / - | 2.12x0.25 / (127--fuel) | |
| Mk 78 Mod 1 Shrike AGM-45B GM | Polyurethane / Ammonium perchlorate | 1.3x0.2 / 78 | |
| Mk 27 Mod 4, Standard-ARM AGM-78 GM | Mixture of polybutadiene & polyurethane / Ammonium perchlorate | 2.62x0.343 / around 360 | |
| TX-481 (company), Maverick AGM-65A and -65B GM | Composite fuel (polysulfa polymer with ammonium perchlorate) | 1.02x0.27 / 47.2 | Thrust of 4540 kg(f), launch mode; 990 kg(f) in cruising mode. Cumulative pulse 6160 kg(f), time of operation 3.5 seconds |
| SR115-AJ-1 (company), Maverick GM | HTPB / Ammonium perchlorate | 1.02x0.27 / 48.4 | Low-smoke |

**Table 1 - Characteristics of Solid-Propellant Rocket Motors (Continued)**

| Designation, Where Used | Fuel / Oxidizer | Length x Diameter, m / Wt (Fuel Wt), kg | Other Characteristics |
|---|---|---|---|
| WPU-5B (company), Skipper guided bomb | Polyurethane / Ammonium perchlorate | 1.3x0.2 / 78 | |
| Helios, sustainer motor of Exocet AM-39 antiship missile [ASM] | Nitramit dibasic fuel | - x0.35 / (150) | Cumulative pulse 28300 kg(f), time of operation over 180 seconds |
| Prades, booster of Kormoran AS-34 ASM | Dibasic fuel | - / (9.36) | Thrust 2750 kg(f), time of operation 1 second |
| Ecole-4, sustainer motor of Kormoran AS-34 ASM | Same as above | - x0.34 / - | Thrust 285 kg(f), time of operation around 100 seconds |
| Booster of Harpoon AGM-84A ASM | Polyurethane / Ammonium perchlorate | 0.74x - / 137(66) | Thrust 6600 kg(f) |
| SEP-299, booster of Sea Killer Mk 2 ASM | Dibasic fuel | - / - | Thrust 4400 kg(f), time of operation 17 seconds |
| SEP-300, sustainer engine of Sea Killer Mk 2 ASM | Composite fuel | - x0.21 / - | Thrust 100 kg(f), time of operation 73 seconds |
| Booster of Otomat ASM | Composite fuel | - / - | Thrust 3500 kg(f), time of operation 4 seconds |
| Booster of AS-30 GM | - | - x0.33 / (57) | Cumulative impulse 10700 kg(f), time of operation 2 seconds |
| Booster of AS-30L GM | - | 0.542x0.33 / 52.7 | |
| Sustainer motor of AS-30L GM | - | 0.584x0.33 / 70 | |
| TX-657 (company), Hellfire AGM-114A antitank GM [ATGM] | HTPB / Ammonium perchlorate | 0.59x0.178 / - | |
| Booster of HOT ATGM | Dibasic fuel | - / - | Time of operation 0.9 seconds |
| Sustainer motor of HOT ATGM | Same as above | - / - | Thrust 24 kg(f), time of operation 18 sec |
| SR105-AJ-1 (company), 70-mm free-flight rocket | Polybutadiene / Ammonium perchlorate | 0.34x0.07 / 5.9 | |

**Table 2 - Characteristics of Turbojet and Turbofan Engines of Air-to-Ground and Air-to-Ship Guided Missiles**

| Notation (Type) | Thrust, kg(f) | Specific Fuel Consumption, kg/kg-hr | Dimensions, m: Length | Dimensions, m: Diameter | Dry Weight, kg | Application |
|---|---|---|---|---|---|---|
| F107-WR-100 (Turbofan) | 270 | * | 0.8 | 0.305 | 58.5 | AGM-86B air-based cruise missile |
| J402-CA-400 (Turbojet) | Around 300 | 1.2 | 0.75 | 0.32 | 45.4 | Harpoon AGM-84 antiship missile |
| TRI60-1 Mod 067 (Turbojet) | 350 | 1.22 | 0.75 | 0.33 | 47 | Sea Eagle antiship missile |
| TRI60-3 (Turbojet) | 400 | 1.18 | 0.75 | 0.33 | 45 | Under development [razrabatyvatsya] for antiship missiles |
| TR281 Arbizon-III (Turbojet) | 400 | 1.12 | 1.4 | 0.4 | 115 | Otomat antiship missile |
| TRI60-2 Mod 077 (Turbojet) | Around 380 | Under 1.2 | 0.75 | 0.33 | 45 | RBS-15 antiship missile |

(particularly glycidilazide) and propellants making it possible to control combustion characteristics by an appropriate choice of the chemical composition and size of grain.

On the basis of development [razrabotka] of new high-energy solid propellants it is planned to create [sozdat] a so-called kinetic weapon which destroys a target by means of high kinetic energy. The composite fuel used in the Canadian CRV-7 free-flight rocket gives the rocket a maximum speed of over 1,200 m/sec and a kinetic energy of over 3.2 MJ. It is reported that the motor of the hypersonic HVM (Hyper Velocity Missile) being developed [razrabatyvat] in the United States will permit its acceleration to a speed of 1,500 m/sec in 0.6 seconds.

Much emphasis also is being placed on creating [sozdaniye] low-smoke solid-propellant rocket motors which make it possible to reduce the missile's detectability on the flight path. In particular such a motor (TX-633) has been developed [razrabotan] in the United States for the Maverick air-to-ground guided missile.

**Turbojet and turbofan motors** are used in propulsion units of missiles with a long range of fire (antiship and cruise). Turbojet motors are used basically in antiship missiles. Their weight-size characteristics are considered determining and specific fuel consumption secondary, since the maximum range of fire of an antiship missile is 150 km. Conversely, the determining parameter of cruise missile motors is specific fuel consumption, and so turbofan motors are considered advisable for such missiles.

Antiship missiles of West European development [razrabotka] are equipped primarily with small turbojet engines such as the TRI of the French firm of Microturbo, and the American Harpoon antiship missile is fitted with the Teledyne J402-CA-400 engine. It is designed as a single-shaft engine with axial-centrifugal compressor (one axial and one centrifugal stage), annular combustion chamber and single-stage turbine. The rotor's rotational frequency is 41,000 rpm, airflow 4.35 kg/sec, and pressure ratio 5.8. The turbojet engine operates on high-energy JP-10 fuel. It is started by a pyrotechnic starter and fuel ignition is electrical with oxygen replenishment. Engine operating life is 1 hour and combustion chamber operating life is 8 hours.

The Williams Research F107-WR-100 turbofan engine is installed in the American AGM-86B air-based cruise missile. It is made according to a two-shaft scheme with a two-stage fan, combination compressor (two axial stages and one centrifugal stage), annular combustion chamber with rotating fuel injector (fuel delivered through shaft) and multistage turbine. The pressure ratio is 13.8. The engine operates on JP-9 fuel. Basic characteristics of turbojet and turbofan engines of air-launched missiles are given in Table 2.

The United States and NATO give air-to-ground air-launched missiles an important place in implementing their aggressive plans and they are working to further improve the motors for them.

It is reported in particular that the United States is developing [razrabatyvatsya] an improved version of the F107-WR-103 turbofan for air-based cruise missiles. According to specifications, it is to have a 40 percent increase in maximum thrust in the cruising flight mode (at sea level, Mach 0.65) with a 5 percent reduction in specific fuel consumption. Airflow has been increased in the engine and pyrotechnic fuel ignition is used. JP-9 is used as the starting fuel and JP-10 for cruising flight (it is less costly and more stable but has a high flash point). The turbofan is designed for a storage period of five years. The F112 turbofan is being created [sozdavatsya] for the air-based ACM (Advanced Cruise Missile), which in the assessment of western specialists will provide a 40 percent increase in its range of fire.

The JP-10 and JP-9 fuels being used in cruise missiles are categorized as synthetic fuels. JP-10 is a monopropellant (exotetrahydrodicyclopentadiene) and JP-9 is a

**Table 3 - Specific Impulse of Liquid-Fuel and Solid-Fuel Ramjet Engines**

| Type Ramjet Engine | Specific Impulse, sec | Specific Impulse x Fuel Density, sec-kg/dm$^3$ |
|---|---|---|
| Liquid-fuel ramjet engines: | | |
| Kerosene (density 0.8 kg/dm$^3$) | 1500 | 1200 |
| Shelldyne (1 kg/dm$^3$) | Around 1400 | 1400 |
| Solid-fuel ramjet engines: | | |
| Fuel content 70% (1.15 kg/dm$^3$) | 1100 | Over 1250 |
| High-energy fuel with 45% boron (1.7 kg/dm$^3$) | 1250 | Over 2100 |

mixture of methylcyclohexane, JP-10 and RJ-5 (hydrogenated dimers of norborodiene). JP-9 has a kinematic viscosity of 50 centistokes at -54 degrees Centigrade, a freezing point of -54 degrees Centigrade and heat of combustion of 9,450 kcal/l.

NATO presently intends to develop [razrabotat] a tactical air-to-ground guided missile with a range of fire of several hundred kilometers. According to specifications for such a missile's engine, it is to be multifuel, have a thrust of 350-450 kg(f), a specific fuel consumption less than 1.3 kg/kg-hr, reliability of 0.985 and storage life of 5-10 years. Its operating time should provide for maximum flight duration equal to 1.5 hours.

The United States also is creating [sozdavatsya] new types of engines for subsonic air-to-ground guided missiles. For example, Teledyne is developing [razrabatyvat] a compound turbofan in which a high-rpm diesel is used as the "internal" eccentrically located loop. Judging from foreign press materials, its demonstration tests already have been held. This same firm is working on a recuperative engine project.

**Ramjet engines** essentially are only beginning to be used in air-launched missile weapons. The French ASMP air-to-ground guided missile is equipped with a liquid-fuel ramjet engine; the firms of Marquardt and Vought in the United States are developing [razrabatyvat] a solid-fuel ramjet engine on a competitive basis for the AIM-120 air-to-air guided missile; and NATO is working to create [sozdaniye] the supersonic ANS antiship missile with ramjet engine.

The interest in ramjet engines is explained above all by the fact that these engines permit a considerable increase in range of fire of missiles with acceptable weight characteristics, since it is necessary to have only fuel aboard the missile while the oxygen needed for the combustion process enters from the atmosphere. The most important parameters for ramjet engines are considered to be specific primary thrust, inasmuch as frontal resistance is a function of it, and specific impulse. With an increase in flight speed (at Mach greater than 1.5) the advantages of ramjet engines over turbojets and turbofans considerably increase. Characteristics of different types of ramjet engines according to specific impulse are given in Table 3.

Western specialists assume that without cooling, ramjet engines with subsonic combustion (i.e., it occurs in the subsonic flow) can be used at speeds up to Mach greater than 5 at high altitudes and long flight ranges and at Mach 3-3.5 at low altitudes. Maximum altitudes of application depend on the combustion process in the engine. It is believed that for ramjet engines with subsonic combustion they are 36-37 km. It is planned to use ramjet engines with supersonic combustion in missiles with flight speeds of Mach 5. The area of their possible regimes is shown in Fig. 2. At speeds up to Mach 5-7 ramjet engines with supersonic combustion can operate on high density hydrocarbon fuel.

It is assumed that by the mid-1990's engines will be created [sozdat] for speeds of Mach 6 and subsequently for speeds up to Mach 12. Both liquid-fuel and solid-fuel ramjet engines are being developed [razrabatyvatsya]. The former provide better engine control, especially when used in air-to-air guided missiles, since in this case

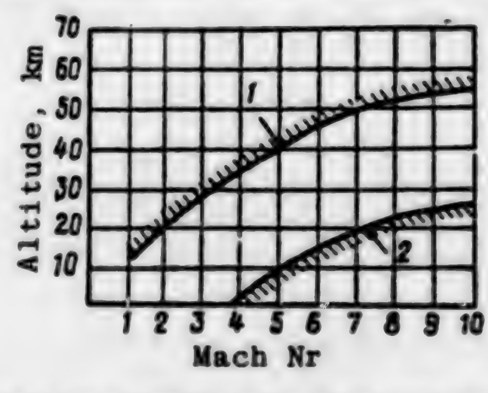


**Fig. 2. Area of possible ramjet engine operating modes: Key:Limit determined by combustion stability (based on**
1. Altitude, **pressure); 2—Speed limitation**
2. Mach number

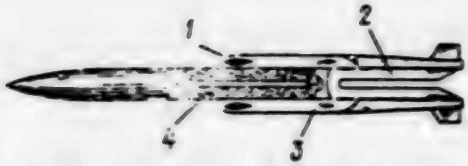


**Fig. 3. Operating principle of solid-fuel ramjet engine with gas-generator fuel feed:**

Key:
1. Air intake (four)
2. Combustion chamber (it contains the booster fuel charge)
3. Supply of hot gases (products of incomplete gas generator fuel combustion)
4. Gas generator

the airflow during missile flight can change by 15 times. Pressurized fuel feed using a gas generator or inert gas is envisaged in such engines. The creation [sozdaniye] of integrated designs in which the solid-fuel rocket booster is accommodated in the combustion chamber is the trend in ramjet engine development [razvitiye]. Such engines have been called rocket-ramjet engines. In them the pressure in the booster combustion chamber can reach 140 kg/cm$^2$, while design pressure in the ramjet engine combustion chamber is considerably less—up to 7 kg/cm$^2$. Therefore after the booster fuel charge burns out its nozzle is ejected since it does not conform to conditions of the combustion process in the ramjet engine combustion chamber.

It is planned to use chiefly a gas-generator fuel feed in solid-fuel ramjet engines being developed [razrabatyvat]. A diagram of the operation of such a fuel feed is shown in Fig. 3 (in the example of a French ramjet engine). The gas generator grain contains a minimum amount of oxidizer which should provide for stable fuel burning but incomplete combustion. Gaseous products of incomplete combustion (having a sufficient amount of combustible components) are fed to the ramjet engine combustion chamber in which the combustion process occurs as with the feed of conventional fuel. The design of liquid-fuel rocket-ramjet engines being created [sozdavatsya] in the United States for tactical air-launched missiles is shown in Fig. 4.

Research and development [razrabotka] in the area of ramjet engines also is being done in the FRG and Sweden in addition to the United States and France. For example, the FRG tested a solid-fuel ramjet engine with casing diameter of 0.22 m and thrust of 800 kg(f), as well as a small ramjet engine with casing diameter of 65 mm. In the opinion of West German specialists the calorific value of solid fuels for such engines can be increased to 1,400 kcal/kg with a density to 2 kg/dm$^3$. The firm of Flygmotor in Sweden has tested liquid fuel and solid fuel rocket-ramjet engines. The following compositions were used as solid fuels: 50 percent ammonium perchlorate, 30 percent aluminum and 20 percent polybutadiene; 45 percent ammonium perchlorate, 40 percent boron and 15 percent polybutadiene; 30 percent ammonium picrate and 70 percent polybutadiene; and fuel containing magnesium.

**Liquid fuel rocket motors** are used on a limited basis in propulsion units of air-launched missiles (in particular, liquid fuel rocket motors are installed in one Swedish antiship missile and in the American Bullpup air-to-ground guided missile), and there are no plans to use them in future air-launched missiles.

According to foreign press reports, that is the present status and some of the prospects for development [razvitiye] of propulsion units of air-launched missiles of capitalist countries.



6904

## Improvement in FRG Air Defense System

*18010069k Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) p 52*

[Article by Lt Col S. Vasilyev]

[Text] The foreign press reports that in accordance with plans of heads of the aggressive NATO bloc, the FRG Armed Forces command is continuing work to implement a program for strengthening national air defense

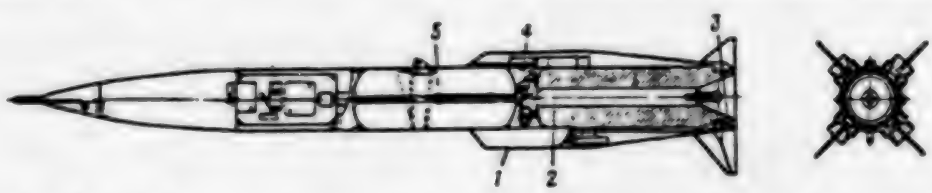


**Fig. 4. American liquid-fuel rocket-ramjet engine being developed [razrabatyvat] for tactical air-launched missiles (project):**

Key:
1. Air intake (four)
2. Solid-fuel booster (in ramjet engine combustion chamber)
3. Booster nozzle (jettisoned after booster fuel burnout)
4. Liquid-fuel feed control system
5. Liquid-fuel tank

along with building up Air Force striking power. According to a western military press report, in the spring of 1986 the FRG completed deployment of all planned facilities of the GEADGE (German Air Defense Ground Environment) automated system for command and control of air defense forces and resources. The official ceremony for completely turning over the automated control system was held in April 1986 in Messstetten in the presence of FRG Air Force Inspector (CIC) Lt Gen Aimler. In his statement to representatives of the Bundeswehr command, NATO and local authorities, he declared that the "GEADGE automated control system is the most fully and comprehensively tested air defense command and control system" and that its becoming operational "opens up new opportunities for a sharp increase in effectiveness of the entire air defense system of the FRG and of NATO as a whole."

In the views of NATO military experts, the GEADGE automated control system represents a component part of the NATO air defense automated control system. Its zone of responsibility extends to the southern part of FRG territory (air defense area of NATO's 4th JTAC [Joint Tactical Air Command] in the Central Europe Theater.

According to foreign press data, this system includes an air defense sector operations center in Boerfink; four control and warning centers in Messstetten, Freising, Lauda and Birkenfeld; three early warning radar stations deployed along the border with Czechoslovakia on mounts Wasserkuppe, Doebraberg and Grosser Arber; several mobile radar stations as well as air situation data receiving terminals at main Air Force airfields and in Bundeswehr SAM battalions in the 4th JTAC air defense area.

The above facilities (control and warning centers, radar stations and so on) presently included in the GEADGE automated control system were deployed, their structure was developed, and they were outfitted with appropriate radar, computer and communications gear in the period from 1960 through 1985. In particular, during the last three years the 412L radars at all control and warning centers and radar stations were replaced by the HADR 3D antijam radars. The latter were developed [razrabotat] and series-produced by the American firm of Hughes. It is equipped with more sophisticated IFF gear. This radar's maximum airborne target detection range is 400 km. Final tests of this radar were conducted by West German specialists in California. Total cost of the completed project is 430 million West German marks.

Each of the control and warning centers is equipped with an entire complex of computers which includes one main computer and five auxiliaries as well as electronic panels, displays and up-to-date communications gear. This complex is used to process all air situation information coming to the control and warning center and to produce an optimum decision variant for engaging a particular airborne target. Based on these data an order is issued to the appropriate fighter aviation subunit or SAM battalion for intercepting or opening fire against the airborne enemy.

Personnel for manning system facilities are trained in special courses which opened in 1983 with the Bundeswehr's 2d Air Force Technical School.

Foreign military specialists believe that the operational GEADGE system creates [sozdat] continuous radar coverage of the southern part of FRG territory and substantially improves capabilities of the entire air defense system of the FRG and NATO in the Central Europe Theater. In addition it is noted that in peacetime this makes it possible to simulate an air situation essentially resembling a real (combat) situation, which is of great importance in training the crews of radar stations, control and warning centers and other organs for control of active air defense resources.

Plans for further improving the GEADGE automated control system and expanding its capabilities provide for interfacing it with the Air Force command and control system under development [razrabatyvat], with command posts of American SAM units stationed on the territory of West Germany (at the present time coordination is maintained with them manually, i.e., without automation, using traditional communications equipment), and with the FRG Air Force Eifel automated control system. In addition, it is planned to equip all radar stations with future models of computers and communications gear (some of them already are in the development [razrabotka] stage).



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## U.S. Navy Submarine Forces

*18010069l Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 53-57*

[Article by Capt 1st Rank V. Chertanov]

[Text] The U.S. Navy submarine forces are one of the primary naval arms. Very great attention traditionally is given to their development [razvitiye] and improvement.

The importance of submarine forces in plans for aggressive U.S. military preparations is determined by the importance of the strategic and operational-tactical missions which they are called upon to accomplish in warfare in ocean and sea TVD [theaters of military operations] within the scope of wars varying in scale from general to "limited" with or without the use of nuclear weapons.

The set of these missions includes participation in an all-out nuclear attack by delivering ballistic missile strikes against strategic ground targets on the territory of the USSR and other Warsaw Pact countries as well as delivery of strikes against shore and sea targets by medium-range cruise missiles with conventional or nuclear warheads; engaging enemy submarines in their combat patrol areas and on deployment routes; antisubmarine protection of ballistic missile submarines, naval attack forces and convoys in their tactical employment areas and in transit; disruption of enemy sea lines of communication and laying minefields; reconnaissance and so on.

The order of battle of the regular American Navy has 140 submarines of various subtypes including 36 nuclear-powered ballistic missile strategic submarines, 99 nuclear-powered multirole submarines, four diesel attack submarines and one test submarine. There are three submarines in the Navy's reserve (one former SSBN with missile compartments dismantled and two nuclear-powered multirole submarines).

More than 20 auxiliary vessels of the regular Navy and of the Military Sealift Command [MSC], including four nuclear-powered ballistic missile submarine tenders, eight multirole submarine tenders, six rescue ships and three SSBN tender support ships (from the MSC), provide combat support to submarines.

**Nuclear-powered ballistic missile submarines** represent an important component of the triad of U.S. strategic offensive forces. The increased concealment of SSBN tactical employment provides them with high survivability and least vulnerability in comparison with other components under conditions of enemy countermeasures. In combination with the great attack might and high accuracy of fire of ballistic missiles, this permits the sea-based strategic offensive forces to serve as an effective means of nuclear attack not only in first but also subsequent strikes, in the opinion of western strategists.

At the present time the Navy has eight of the latest "Ohio" Class SSBN's and 12 "Lafayette" Class SSBN's armed with 24 and 16 Trident-I (C4) ballistic missiles respectively, as well as 16 "Lafayette" Class SSBN's each armed with 16 Poseidon-C3 missiles. Three "Lafayette" Class SSBN's have been removed from the combat-ready order of battle (their missile compartments were dismantled) in accordance with the Treaty on Limitation of Strategic Offensive Arms (SALT II)—two have been removed from Navy rolls and the fate of the third ("Sam Rayburn") has not yet been determined.

SSBN's of earlier construction (1960-1963) of the "George Washington" (5) and "Ethan Allen" (5) classes were removed from the order of battle of strategic sea-based missile forces during the period 1980-1984, refitted as multirole submarines (SSN), and then almost all were removed from the Navy's rolls. Two "Ethan Allen" Class submarines (SSN 609 and 611) used in the interests of the Navy's special forces after refitting are the exception.

Construction rates of new "Ohio" Class SSBN's (submerged displacement 18,700 tons) are being maintained at a level of one ship a year. It is planned to build a total of up to 24 submarines of this class. Beginning with the ninth (SSBN 734), they will be armed with the more advanced Trident-II (D5) SLBM. Subsequently the first eight SSBN's also will be refitted with this type of missile, which has a range of fire of 11,000 km (the Trident-I has a range of 7,400 km). As new SSBN's are built "Lafayette" Class submarines will be removed from the American Navy order of battle.

**Nuclear-powered multirole submarines** (SSN) are the largest component of submarine forces. The regular Navy's order of battle has a total of 99 SSN's and two are in reserve. The operational-strategic importance of this submarine subtype grows noticeably with the American Navy's adoption of the Harpoon antiship missile and especially of the medium-range (up to 2,500 km) Tomahawk cruise missile with nuclear and conventional warhead. According to foreign press data, over 70 submarines presently are armed with the Harpoon antiship missile and at least 25 with the Tomahawk cruise missile.

In the opinion of western military analysts, the employment of cruise missiles from submarines substantially expands their range of tactical employment: the destruction range of waterborne targets increases 5-10 times (in comparison with torpedo ordnance). New methods and procedures for coordinating with other fleet forces in delivering missile strikes against enemy surface, shore and ground targets both in a nuclear and in a conventional war in a theater are being developed.

"Los Angeles" Class SSN's (see color insert [color insert not reproduced], submerged displacement 6,900 tons, submergence depth down to 450 m) are the most advanced nuclear-powered submarines in the U.S. Navy. Their construction also presently continues at a rate of four submarines a year. Beginning with the "Providence" SSN 719 the submarines are being outfitted with Tomahawk cruise missile vertical launchers. Twelve vertical launchers are accommodated outside the pressure hull in the area of the forward main ballast tank. It is planned to build a total of 67 SSN's of this class, of which 36 will have vertical launchers for cruise missiles. The submarines are fitted out with the modern AN/BQQ-5 sonar system. The Sea Lance, a new type of antisubmarine guided missile of increased range (up to 160 km) compared with SUBROC, as well as the SIAM antiaircraft missile (with a range of fire of 5-7 km) for self-defense against an air threat are being developed [razrabatyvatsya] for them.

Beginning in 1989 the United States plans to begin constructing a new series of 30 "Seawolf" SSN 21 Class nuclear-powered multirole submarines with improved performance characteristics: a lesser noise level, increased submerged speed (above 30 knots), increased submergence depth and greater capabilities for operating beneath ices in the Arctic ("Los Angeles" Class SSN's beginning with the "Chicago" SSN 721 also will have these capabilities).

The United States does not plan to build diesel submarines. "Barbel" and "Darter" class submarines used basically for practicing combat training missions are to be removed from the Navy's order of battle by the early 1990's. It is planned to retain at least 100 nuclear-powered multirole submarines in the U.S. Navy order of battle in the next decade. Performance characteristics of American submarines are given in the table.

Organizationally U.S. Navy submarines are part of large strategic formations of the Atlantic and Pacific fleet submarine forces in peacetime and wartime. The commanders of fleet submarine forces (authorized rank of vice admiral) exercise control of day-to-day activities and tactical employment (as part of the 14th and 42d operational forces) of all submarines in the corresponding fleets through their staffs and operations control centers (OKTsU). Control of submarines transferred to the operational fleets is exercised by the commanders in chief of the fleets (Second, Third, Sixth and Seventh) through their fleet command centers (FKTs), submarine operations control points (OPU PL) and commanders of corresponding task forces (24th, 34th, 69th and 74th). Logistical support and combat training of submarines are conducted within the framework of the administrative organization as part of tactical forces—submarine groups and squadrons (Fig. 1).

Three groups (2d, 6th and 8th), the 14th, 16th and 18th SSBN squadrons, five squadrons of multirole submarines (2d, 4th, 6th, 8th and 10th) and the 12th Development Squadron are in the U.S. Atlantic Fleet Submarine Force (headquarters at Norfolk Naval Base) (Fig. 2). The principal naval bases and submarine basing points in the Atlantic are as follows: New London, Connecticut; Norfolk, Virginia; Charleston, South Carolina; Kings Bay, Georgia; Holy Loch, Scotland; La Maddalena, Italy.

The U.S. Pacific Fleet Submarine Force (headquarters at Pearl Harbor Naval Base) has four groups (1st Development, 5th, 7th and 9th), three squadrons of multirole submarines (1st, 3d and 5th) and one squadron (17th) of SSBN's (Fig. 3). Submarines in the Pacific are based at the naval bases of Pearl Harbor, Hawaii; San Diego, California; Bangor, Washington; Yokosuka and Sasebo, Japan.

Submarine groups have shore headquarters (the group commander is a rear admiral) intended chiefly for logistical support including repair and maintenance of SSBN's (2d, 6th and 9th groups), SSN's and SS's. The compositon of groups varies (submarines to be repaired are periodically transferred to the groups), with the exception of the 1st Development Group, functions of which include deep-sea tests and research. For this reason, in addition to one or two specially outfitted multirole SSN's, this group includes the "Point Loma" deep submergence research vessel, the "Dophin" experimental submarine, two rescue vessels, and three DSV and three DSRV deep submergence vehicles.

Submarines conduct weapon tests, including of Tomahawk cruise missiles, in the Pacific Fleet test range area near Point Mugu, California.

Squadrons of SSBN's and multirole submarines include from 5 to 13 submarines, a tender, as well as one or two rescue vessels or floating docks each and are intended for practicing combat training missions before going out on combat patrol. The squadron commander has the rank of captain. Squadron composition is relatively stable.

In the opinion of western military specialists, renewal of the ship order of battle of submarine forces and arming submarines with modern weapons contribute to a buildup in offensive capabilities of this arm of the American Navy and to a choice of new directions in their operational-strategic use in the interests of the U.S. military-political leadership's aggressive aspirations. Submarines of the "Skate," "Skipjack" and "Seawolf" classes are to be replaced first.



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**Performance Characteristics of U.S. Navy Submarines**

| Type Submarine—Number in Commission (Side Numbers), Year Commissioned | Displacement, tons: Surface / Submerged | Principal Dimensions, meters: Length / Beam / Draft | Speed, knots: Surface / Submerged | Crew (officers in parens) | Armament[1] |
|---|---|---|---|---|---|
| **Nuclear-Powered Ballistic Missile Submarines** | | | | | |
| "Ohio"—8 (SSBN 726—733), 1981—1987 | 18 000 / 18 700 | 170.7 / 12.8 / 10.8 | · / 25 | 133 (19) | Trident-I ballistic missile [BM]—24[2], 533-mm torpedo tubes [TT]—4 |
| "Lafayette"—12 (SSBN 627, 629, 630, 632—634, 640, 641, 643, 655, 657, 658), 1964—1966 | 7250 / 8250 | 129.5 / 10.1 / 9.6 | 15 / 25 | 140 (14) or 168 (20) | Trident-I BM—16, 533-mm TT—4 |
| "Lafayette"[3]—18 (SSBN 616, 617, 619, 620, 622—626, 628, 631, 642, 644, 645, 654, 659), 1963—1967 | Same as above | Same as above | Same as above | Same as above | Poseidon-C3 BM—16, 533-mm TT—4 |
| **Nuclear-Powered Multirole Submarines** | | | | | |
| "Los Angeles"—39 (SSN 688—725, 750), 1976—1987 | 6000 / 6900 | 109.7 / 10.1 / 9.9 | 20 / 30 | 143 (13) | 533-mm TT—4, Tomahawk cruise missiles [CM]—8-12, Harpoon antiship missile—4, SUBROC |
| "Sturgeon"—37 (SSN 637—639, 646—651, 660—670, 672—684, 686, 687), 1967—1975 | 3640 / 4640 | 89 / 9.5 / 7.9 | 20 / 30 | 111 (13) | 533-mm TT—4, Tomahawk CM—8, Harpoon antiship missile—4 (except SSN 637, 650, 653, 661, 664, 675-678, 683), SUBROC |
| "Permit"—13 (SSN 594—596, 603—607, 612—615, 621), 1962—1968 | 3750 / 4300 | 84.9 / 9.6 / 8.7 | 20 / 30 | 113 (13) | 533-mm TT—4, Tomahawk CM—4 (except SSN 604-606, 612, 614, 615), SUBROC |
| "Skipjack"—4 (SSN 585, 588, 590, 591), 1959—1961 | 3075 / 3513 | 76.7 / 9.6 / 8.9 | 20 / 30 | 111 117 ([illegible]) | 533-mm TT—6 |
| "Skate"—1 (SSN 579), 1957—1958 | 2570 / 2861 | 81.5 / 7.6 / 6.7 | 20 / 25 | 139 ([illegible]) | 533-mm TT—8 |
| "Glenard P. Lipscomb"—1 (SSN 685), 1974 | 5813 / 6480 | 111.3 / 9.7 / 9.5 | 20 / 25 | 141 (13) | 533-mm TT—4, Tomahawk CM—8, Harpoon antiship missile—4, SUBROC |
| "Narwhal"—1 (SSN 671), 1969 | [illegible] / 5130 | 95.9 / 13.1 / 8.2 | 20 / 30 | 141 (13) | 533-mm TT—4, Tomahawk CM—8, Harpoon antiship missile—4 |
| "Tullibee"—1 (SSN 597), 1960 | 2317 / 2640 | 83.2 / 7.1 / 6.4 | 15 / 20 | 56 (6) | 533-mm TT—4 |
| "Ethan Allen"—2 (SSN 609, 611), 1962 | 6955 / 7880 | 125 / 10.1 / 9.8 | 15 / 25 | 142 (13) | 533-mm TT—4 |
| **Multirole Diesel Submarines** | | | | | |
| "Barbel"—3 (SS 580—582), 1959 | 2145 / 2895 | 66.8 / 8.8 / 8.5 | 15 / 21 | 85 (8) | 533-mm TT—6 |
| "Darter"—1 (SS 576), 1956 | 1720 / 2388 | 68.7 / 8.2 / 5.8 | 19 / 14 | 93 (8) | 533-mm TT—8 |

Key:
*BM—Ballistic Missile; TT—Torpedo Tube; CM—Cruise Missile; ASM—Antiship Missile; ASGM—Antisubmarine Guided Missile
**"Ohio" Class SSBN's have been armed with Trident-II (D-5) missiles beginning with SSBN 734
*** Missile compartments have been dismantled on SSBN's 623, 635 and 636; they have been removed from combat-ready status.

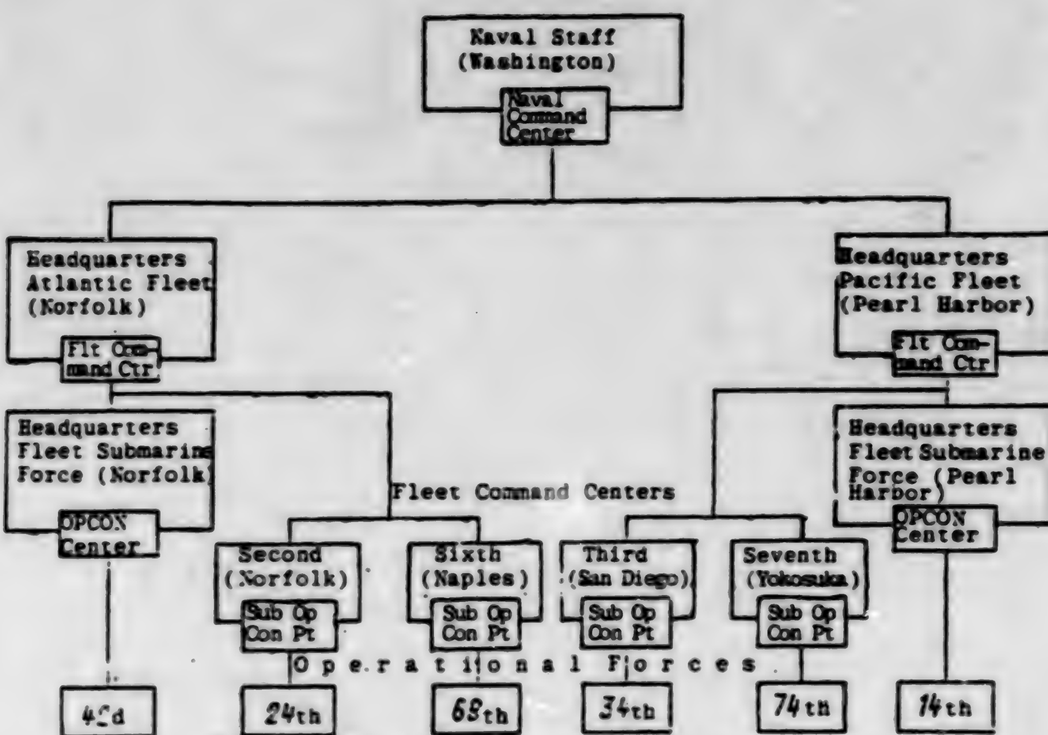


Fig. 1. Diagram of operational control of U.S. Navy submarines

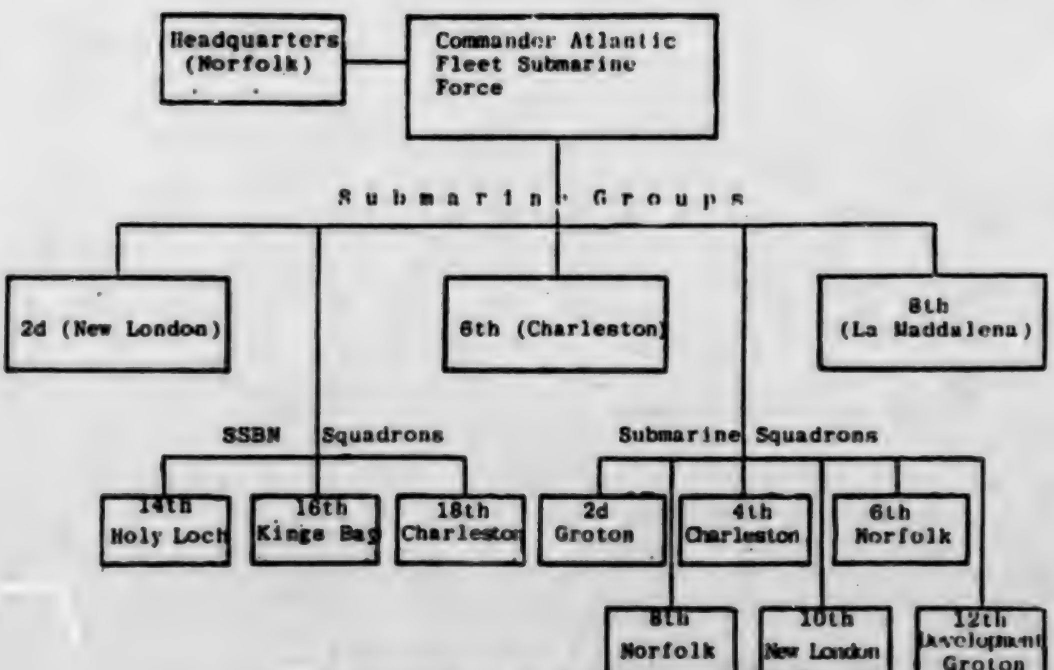


Fig. 2. Organization of Atlantic Fleet Submarine Force

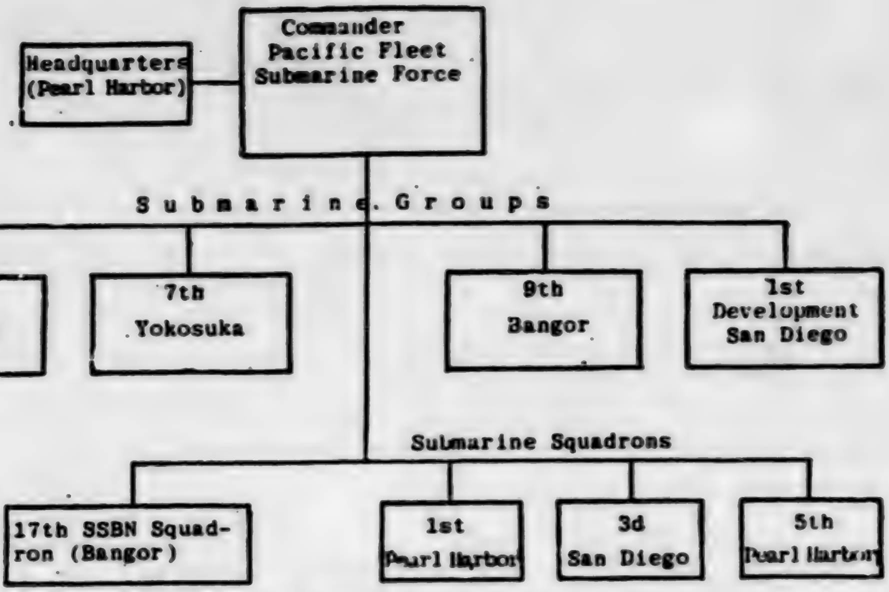


**Fig. 3. Organization of Pacific Fleet Submarine Force**

## NATO Naval Forces Baltic Approaches

*18010069m Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 58-62*

[Article by Capt 1st Rank V. Khomenskiy]

[Text] An important place is set aside for the Baltic Approaches in the aggressive NATO bloc's plans for militaristic preparations to unleash and wage war against countries of the socialist community. According to NATO's subdivision this zone includes the territories of Denmark, the West German Land of Schleswig-Holstein and the Baltic Approaches with all islands located therein. The bulk of this zone is made up of sea area, including the southwestern part of the Baltic Sea (west of Bornholm Island); the straits of Kadetrinne, Fehmarnbelt, Great Belt, Little Belt, Oresund (the Sound), Kattegat and Skagerrak; as well as eastern parts of the North Sea. The strategic importance of the Baltic Approaches is determined by the fact that it is a connecting link between the Northern Europe and Central Europe TVD [theaters of military operations] and permits constant monitoring of the transit of ships and merchant vessels to and from the Baltic and North Sea. Each day in peacetime up to 150 merchant vessels of various countries pass through the Approaches and Kiel Canal carrying economic and other cargoes.

In the assessment of NATO specialists, in wartime the Baltic Approaches will become a site of active employment of surface ships, submarines and naval and air force aviation to establish control over the straits and to ensure reliable functioning of sea lines of communication [SLOC] of bloc member countries. Successful combat actions in this zone can help create favorable conditions for preparation and conduct of strategic operations in the Central Europe Theater and for operations by forces of the strategic Supreme Allied Command Atlantic.

Achieving these objectives is the responsibility of the NATO Naval Forces Baltic Approaches command (headquarters at Karup, Denmark). In peacetime it accomplishes missions of planning and organizing operational and combat training, drawing up plans for tactical employment of forces and resources in its zone of responsibility, planning programs for future organizational development of fleets jointly with national agencies, monitoring the status of combat readiness of ships and units to be transferred to NATO, and other missions. In wartime it exercises direction over combat actions of subordinate forces in accordance with existing plans and the instructions of the CIC, Allied Forces Northern Europe, and it interworks with joint ground and air forces in the zone as well as with adjacent bloc commands to successfully accomplish its assigned missions.

The command does not have forces available under peacetime conditions. The navies of the FRG and Denmark are the basis of forces to be transferred to its operational subordination (with the institution of an official system of NATO alerts or for an exercise period).

The FRG Navy is the most powerful and combat effective component in this grouping. It has four flotillas (destroyers, submarines, guided missile patrol boats, minesweeping forces), an amphibious group (landing

ships and two amphibious transport battalions) and a division of naval aviation (fighter-bomber, reconnaissance, land-based patrol and auxiliary aircraft; antisubmarine and search and rescue helicopters). The Navy also includes a supply flotilla (transports, tankers, tugs).

Ships and auxiliary vessels are based at the Wilhelmshaven, Kiel, Borkum, Olpenitz, Flensburg, Eckernfoerde and Neustadt naval bases; aircraft are based at the Eggebek, Holtenau, Jaegel and Nordholz air bases.

The FRG Navy has over 160 combatant ships and patrol craft including 24 submarines, 13 guided missile destroyers and guided missile frigates (Fig. 1 [figure not reproduced]), 8 frigates and patrol craft (small ASW ships), 19 small landing ships, 2 minelayers, 57 minesweepers, and 40 modern guided missile patrol boats.*

In the Bundeswehr command's assessment, the status of the ship and aircraft order of battle does not yet fully meet modern demands. Because of this considerable attention is given to quality improvement of ships, aircraft and helicopters and to an increase in their attack and fire power. Modernization has been completed on "Luetjens" Class guided missile destroyers, and it is planned to modernize Type 206 submarines and build a new generation of submarines (Type 211) under the program for development [razvitiye] of naval forces for the 1990's.

Substantial changes will occur in the ship order of battle of minesweeping forces. An order was placed in January 1985 for building a series of Type 343 minesweeper/minehunters (ten units). In the near future it is planned to begin building one more series of minesweeper/minehunters (20 of Type 332). It is planned to replace "Schuetze" and "Lindau" class minesweepers with the new ships.

Tornado aircraft (a total of 112 has been ordered) are being delivered to naval aviation to replace the F-104G Starfighter fighter-bombers. Modernization of the Atlantic land-based patrol aircraft has been completed and it is planned to outfit the Sea King search and rescue helicopters with Sea Skua antiship missiles.

The Danish Navy includes four squadrons of combatant ships and patrol craft, a division [divizion] of fishery protection ships, forts and coastal artillery batteries. It has a total of 27 combatant ships including 4 submarines, 5 guided missile frigates (Fig. 2 [figure not reproduced]), 5 frigates, 7 minelayers and 6 minesweepers. In addition there are 10 guided missile patrol boats, 6 motor torpedo boats and around 30 motor patrol boats.

According to calculations by foreign military specialists, the Allied Naval Forces Baltic Approaches can deploy over 220 combatant ships and patrol craft as well as some 140 fighter-bomber and land-based patrol aircraft. Judging from foreign press reports, this grouping of forces is assigned to perform the following primary missions: blockade the Baltic Approaches, engage enemy surface ships and submarines in the Baltic Sea, disturb (disrupt) enemy SLOC, provide antilanding defense of islands and the coast of the Approaches, and protect SLOC in the North Sea and the Baltic Approaches. If necessary, Allied Naval Forces operating in the Baltic Approaches can be reinforced by redeploying the bloc's permanent naval forces in the Atlantic from the East Atlantic as well as some of the forces from the Allied Naval Forces Southern Norway command. It is also planned to support ship groupings with carrier-based aircraft of NATO's attack fleet in the Atlantic.

In the opinion of military specialists, geographic, oceanographic and climatic factors will have a substantial influence on the nature of combat actions in the Baltic Approaches. Consideration and use of these factors under certain conditions will contribute to achieving the objectives of warfare. The relatively small size of the Baltic Sea predetermines the possibility of extensive use of aviation over its water area. The short approach time permits aviation to achieve tactical surprise when delivering strikes against sea and shore targets and to bring pressure against a target for a lengthy time. The side which has won air supremacy is capable of substantially limiting enemy capabilities of employing large surface combatants, especially in hours of daylight and in good flying weather. The short distances between opposing Baltic Sea basin countries in turn permit a sufficient degree of effectiveness in making hit-and-run raids with the forces of guided missile patrol boats and motor torpedo boats and delivering strikes against sea targets operating in the immediate vicinity of one's own coast.

The shallow waters of the Baltic Sea place limitations on employing large surface combatants and large and medium submarines and at the same time favor the effective use of mine ordnance essentially thoughout this water area. Foreign military specialists believe that above all small surface combatants, small diesel submarines, guided missile patrol boats and motor patrol boats will be used for active combat operations in the Baltic Approaches and that their operations will be supplemented by the extensive use of aviation and mine ordnance.

**Blockade of the Baltic Approaches.** Based on the experience of exercises of recent years, it is planned to conduct blockade operations in the Approaches from the western and eastern sectors simultaneously.

Blockade operations from the primary (eastern) sector are to be conducted in echelons to the full depth of the Approaches including the western part of the Baltic Sea. In the opinion of NATO military specialists, underwater and air situation surveillance equipment on Bornholm Island permits promptly uncovering enemy intentions

and practical actions to have ships break through to the Approaches, taking necessary steps, and creating an echeloned defense with naval and air forces and resources.

An important role in blockade operations is given to fighter-bomber aircraft (Tornado, F-104G Starfighter and other aircraft) of the FRG and Danish navies and air forces capable of accomplishing a wide range of missions from reconnaissance to strikes against enemy ships penetrating on distant approaches to the straits. Strikes can be delivered by groups of aircraft from one or more directions using Kormoran missiles, aerial bombs and machinegun-cannon weaponry.

By employing a fixed/mobile method on approaches to the zone, submarines are capable of using torpedo ordnance to destroy detected enemy surface combatants and submarines. In case of advance warning about a penetration being prepared, they can be deployed in advance in the Eastern Baltic and can operate secretly on the initial transit routes of enemy ship groupings. Mobile antisubmarine forces made up of ship hunter-killer groups (two or three ships of the destroyer-corvette types in each) will operate independently or together with land-based patrol aircraft and antisubmarine helicopters on special antisubmarine barriers established on approaches to the straits.

Under cover of aviation based at coastal airfields, guided missile patrol boats and motor torpedo boats capable of effective action against surface combatants, landing detachments and convoys will play an important role in a blockade of the straits. The patrol craft will operate both independently and as part of groups, using the tactics of hit-and-run operations and "ambushes." Aircraft and helicopters may be used to vector guided missile patrol boats to surface targets.

Minelaying can be done both in advance (in a period of threat or in the absence of an immediate threat of enemy naval forces penetrating into the Approaches) and during combat actions. Submarines, land-based patrol aircraft, carrier-based aircraft, minelayers, individual surface combatants, patrol craft and auxiliary vessels are used for minelaying. Laying minefields in the Approaches also is practiced in exercises by B-52 aircraft of the U.S. Air Force Strategic Air Command. Mass minelaying using ferries is possible in case of a threat of capture of the straits. The NATO command also is studying the question of laying minefields controlled remotely from shore in the straits in advance.

It is planned to use coastal artillery capable of hitting surface combatants at ranges up to 10 km in blockade operations in immediate proximity to islands of the Approaches and in Skagerrak Strait (near the coast of Southern Norway).

A blockade of the Baltic Approaches is systematically practiced during the annual Bold Game, Bright Horizon and Blue Harrier exercises of the Allied Naval Forces.

While considering a blockade of the Approaches as the primary mission of the Allied Naval Forces Baltic Approaches, the NATO command also plans to conduct active offensive operations aimed at destroying enemy groupings on approaches to the zone and pressing them into the Eastern Baltic with a subsequent maximum limitation on freedom of actions. It is believed that successful accomplishment of the mission of **engaging enemy naval forces in the Baltic** will greatly help implement the set of measures to blockade the Approaches, to provide antilanding defense of the islands, and to disturb (disrupt) enemy SLOC in the Baltic Sea.

Offensive combat actions on the Approaches and in the Baltic Sea most likely will be conducted by forces of submarines, guided missile patrol boats, motor torpedo boats and fighter-bomber aircraft with extensive use of mine ordnance. The experience of employing the American operational missile group with its flagship, the battleship "Iowa," in the Baltic Operation-85 exercise of the Allied Naval Forces, however, indicates that the NATO command does not preclude the possibility of employing frigate-battleship type ships in the Baltic with reliable air cover.

Naval fighter-bomber aviation (West German Tornado and F-104G Starfighter aircraft) and tactical aviation of the FRG and Danish navies will be employed to deliver surprise massed strikes against enemy naval bases and ports for the purpose of destroying surface combatants located there and demolishing shore facilities and installations. Up to 30-40 aircraft operating in groups from different directions may take part simultaneously in the raids. In the NATO command's opinion, the short approach time (up to 50 minutes) will ensure high tactical surprise and good results in delivering such strikes. Fighter-bomber aviation also is capable of delivering strikes against individual surface targets, ship groups and landing detachments (vectored from command ships or NATO AWACS E-3 airborne early warning and command aircraft).

Concealment of submarine operations permits the bloc command to deploy them to the Eastern Baltic in a period of threat and conduct minelaying in advance near naval bases, at chokepoints and on probable routes of deployment of enemy ship groupings. When submarines are employed in the attack version they can operate both singly (by the fixed/mobile method) at principal nodes of SLOC and as part of tactical groups. Their stations usually are 10x10 or 30x30 nm in size.

Land-based patrol aircraft (West German Atlantics) operating both independently as well as jointly with hunter-killer forces will be used to hunt and kill enemy submarines.

Guided missile patrol boats (Fig. 3 [figure not reproduced]) and motor torpedo boats are considered by the NATO command to be an effective means of engaging surface ships and transports under Baltic Sea conditions.

The range of fire of the patrol boats' missile systems permits them to choose a salvo position beyond the limits of enemy ship gun fire. At the same time, employment of missiles from maximum range is hampered because of the limited effective radius of equipment for detecting small craft. Therefore, without precluding the possibility of employing guided missile patrol boats as type attack forces (6-10 patrol boats in each) for delivering strikes against a previously reconnoitered target, western military specialists give preference to employing them together with surface combatants, motor gunboats, motor torpedo boats, aircraft and helicopters. Mass attacks from different directions are presumed, which contributes to a dissipation of enemy efforts to repel missile strikes and ensures that a certain number of guided missile patrol boats will penetrate to the target. Vectoring guided missile patrol boats using aircraft and helicopters has been an extensive practice in exercises of recent years. An important condition for their successful actions is assurance of concealed deployment (under cover of shore, in hours of darkness, with limited visibility) and swiftness of appearance in an area unexpected by the enemy.

Progress in implementing programs for building guided missile patrol boats and further improving their tactics attest to the fact that they are viewed by the NATO command as a very important component of naval forces in accomplishing missions of winning and maintaining supremacy in enclosed sea theaters of military operations such as the Baltic Approaches.

The NATO command makes the success of combat actions in coastal sectors of the Northern Europe and Central Europe theaters directly dependent on the capability of naval and air forces to disrupt the enemy's movement of troops and military equipment by sea and to deprive him of an opportunity to maneuver forces and resources within limits of the theater. **Disturbance (disruption) of enemy SLOC** will be achieved within the overall set of missions of defending the Approaches and winning supremacy in the Baltic Sea. Primary attention will be given to coordinated actions of naval and air forces in destroying landing detachments and convoys at the exit from bases and along their transit routes to the Approaches, and to disrupting logistical support of ground forces in coastal sectors and of naval forces at sea in the course of combat actions.

Strikes against landing detachments in embarkation areas and on the sea transit by forces of submarines, surface combatants, patrol boats and aviation will in turn be a component element in organizing **antilanding defense** of the Approaches. It is planned to conduct the immediate defense of accessible landing sectors on islands of the Approaches and the coast of the FRG and Denmark by the joint efforts of ground forces, Danish Hemverna subunits and tactical aviation supported by coastal artillery and fleet forces. Mine ordnance plays an important role in this defense. Minelayers, minesweepers, ferries, individual surface combatants and patrol boats will be used for laying mines. The landing of assault forces also will be blocked by engineer works both on the beach (in the form of barbed-wire entanglements, nets and stake obstacles) as well as right as the coastline.

**Protection of SLOC in the North Sea and the Baltic Approaches** pursues the objective of supporting intertheater troop movements and the regrouping of forces within the theater, receiving reinforcing troops arriving with convoys from the United States, Canada and Great Britain, and defending merchant vessels as they proceed from the Baltic Sea and Approaches into protected areas of the Atlantic. It is planned to move troops and military equipment on landing ships and transports placed in small convoys under cover of ship striking forces and hunter-killer forces, submarines, and land-based aviation. Automobile and railway ferries can be used for these same purposes. According to western press data the possibility of moving one or two U.S. Marine expeditionary brigades and a joint Anglo-Dutch Marine brigade to the Baltic Approaches is not precluded. Their most likely landing areas are the west coast of Denmark (near Esbjerg), Sjaelland Island, and islands of the Baltic Approaches. Landing detachments will be defended on the sea transit by establishing a "protected SLOC zone" on western approaches to the Baltic straits (in the North Sea); this involves dislodging enemy antisubmarine attack forces from the zone and providing reliable air cover.

In a period of threat and with the beginning of war it is planned to evacuate merchant vessels to safe areas of the Atlantic. It is planned to use motor torpedo boats operating as part of attack groups and to use the forces and resources of the continental air defense system to protect coastal convoys.

Attaching great importance to its Northern Flank, the NATO command is attempting to maintain the grouping of Allied Naval Forces Baltic Approaches in a high state of readiness and capability to conduct both defensive and offensive combat actions.

**Footnote**

*For more detail on the FRG Navy see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 5, 1985, pp 47-55—Ed.



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## Use of EW Resources by Ship Groupings

*18010069n Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 62-67*

[Article by Capt 2d Rank (Res) F. Voroyskiy, candidate of technical Sciences]

[Text] The command element and military specialists of the U.S. Navy and navies of other countries of the aggressive NATO bloc have high regard for the significance of electronics in naval command and control and in increasing weapon effectiveness, and high regard on the whole for the substantial influence of electronics on the course and outcome both of an individual action and of naval operations. The foreign press notes that electronic warfare [EW] is an inalienable part of combat actions both of ship groupings and of individual surface combatants, submarines or aircraft at any point in the ocean. In accordance with the classification adopted by the United States, EW includes communications intelligence [COMINT] and electronic intelligence [ELINT], electronic countermeasures [ECM] (suppression) and electronic countercountermeasures [ECCM].

COMINT and ELINT comprise the surveillance of signals in operating frequency bands of enemy electronics using reconnaissance receivers, as well as the warning about radar and other kinds of illumination with the help of warning receivers.[1] COMINT is intended for intercepting communications, determining operating parameters and modes, and locating communications equipment and control systems; ELINT is for detecting and classifying early warning, target designation and weapon control radars, IFF systems and radio navigation systems. The objective of ECM is active and passive jamming as well as dispensing decoys for protecting a grouping's ships against enemy weapons. Priority is given to developing [razvitiye] means and methods of combating radars installed on various platforms and combating radar homing heads of ship-based, air-based and land-based antiship missiles which presently represent the greatest threat to surface ships.

ECCM deprives the enemy of an opportunity to reconnoiter the emissions of protected electronics and ensures its effective operation under conditions of deliberate jamming. This is accomplished by using special antijam circuitry and electronic scramblers as well as modes of


**Fig. 1. Forces and resources of type U.S. Navy multirole carrier force performing EW missions: AN/ALQ-108, -126B, -142, -149, -162, -164 and -165—special purpose and multipurpose airborne EW equipment; AN/ALR-47, -59, -66, -67, -73, -76 and -77—airborne receivers; AN/BRD-1 and -7—equipment for surveillance and direction finding of submarines; AN/SLQ-17, -32, -33 and -34—shipboard special purpose and multipurpose EW equipment; AN/SSQ-70, -74, -80 and -82—sonobuoys; AN/WLR-1, -4, -6 and -8—surveillance receivers installed on ships and submarines; AN/SAR-8—shipbaord IR acquisition set; AN/SRS-1—radio direction finder; AN/SLR-22—EW receiver; Mk 36—RBOC launcher; ACS—automated control system; AEDAS—airborne electronic data processing system; AEWS—advanced EW system; CUES—automated data processing system; SSES—submarine detection system**

combat employment of electronic equipment. Missions of ensuring electromagnetic compatibility with respect to a reduction in mutual effects of various types of friendly electronics including EW equipment also are accomplished within the scope of ECCM.

Using a U.S. Navy multirole carrier force as an example based on foreign press data, the basic principles of employing EW equipment intended for protecting the force's ships against antiship missiles are considered below. The type variant of the force includes 7-14 combatant ships of various types (carriers, guided missile cruisers, destroyers, guided missile frigates and others).

In the opinion of U.S. military specialists, the greatest threat to multirole carrier forces comes from mass attacks of antiship missiles employed from various platforms and from several directions. The command authorities of the U.S. Navy and joint NATO naval forces believe that not one of the EW systems of an individual ship operating independently can protect ships of the multirole carrier force. This mission can be accomplished only by a defense well echeloned in depth and coordinated in time of actions, a defense based on comprehensive use of different EW equipment (Fig. 1) within the framework of a naval tactical data system [NTDS]. The next phase is integration of control over mixed reconnaissance and EW resources of the force and provides for creating [sozdaniye] an integrated system, a block diagram of which is shown in Fig. 2.

According to foreign press data, depending on the missions being accomplished by a carrier force and on its composition and employment tactics, the carrier force's EW equipment can operate at various distances (1,000 km or more) from the center of the formation or flagship. This corresponds to the initial stage of the closing of fleet forces, the search for enemy groupings and approximate determination of their location. Tentatively 1,000-100 km is the stage of target selection and allocation of forces for delivering a strike and launching antiship missiles; 100-20 km is the stage of guiding antiship missiles until lock-on of the target for automatic tracking by its homing head; less than 20 km is the terminal leg for switch-on of the homing head and flight of the antiship missile in the homing-on-target mode.

**Employment tactics of EW equipment.** The western press emphasizes that EW presently cannot be viewed as the simple opposition of technical systems. It is acquiring an offensive character and is becoming a specific form of combat during which pressure is brought to bear both on command and control and communications systems (of the multitude of possible options, the most important command and control channels must be disrupted), as well as on means of surveillance; a special role is given to passive and active expendable decoys among a carrier force's EW resources.

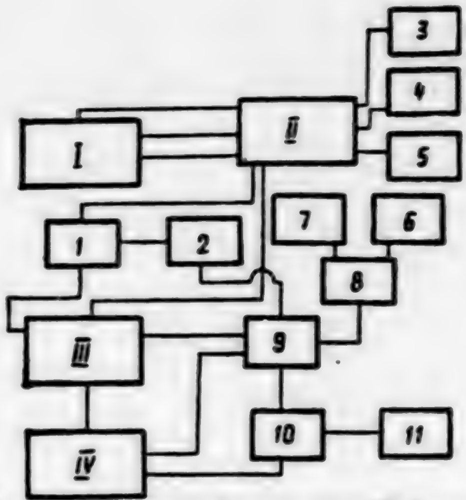


**Fig. 2. Integrated control system of multirole carrier force flag command post:**

Key:
I. EW forces and resources external to ship
II. EW coordination module
III. NTDS
IV. EW control system
1. Force commander's data display subsystem
2. Intelligence display subsystem
3. Operational intelligence
4. Tactical intelligence
5. Fleet operational warning network
6. Force commander's communications system
7. Digital communications system
8. Processor
9. On-board correlation system
10. Radio receiver
11. Tactical digital communications system

The most widespread kinds of jamming produced by enemy acquisition and weapon control systems are passive antiradar jamming and IR decoys.

Based on the specifics of tactical employment of these kinds of jamming, the principal dispenser of decoys at the present time is considered to be deck-based aviation outfitted with special gear which forms chaff clouds immediately after the chaff is dispensed. The range for laying down passive radar jamming and IR decoys by ship resources is limited and rarely exceeds 10 km$^2$.

*At distances greater than 1,000 km* the primary mission of EW is considered to be ECM against enemy command and control and communications systems. In addition to using a strict regime limiting the operation of radiotechnical equipment of the multirole carrier force's ships, ECM includes a broad set of active operations aimed at hampering the acquisition and determination of composition, coordinates and movement parameters of the multirole carrier force, as well as at disrupting the enemy system for early target allocation of weapon platforms. It

is simultaneously proposed to conduct ELINT, communications intercept and transmission of dummy traffic, which introduces garbles and disorganization to the operation of enemy communications equipment.

With consideration for the specific nature of combat actions waged with the enemy at a distance of over 1,000 km, in this case the primary burden of EW rests with specially assigned forces in the U.S. Navy and navies of other capitalist states. These forces chiefly include deck-based airborne early warning and control aircraft (E-2C Hawkeye), EW aircraft (EA-6B Prowler) and helicopters; ships, deck-based attack aircraft, land-based patrol aircraft and other forces and resources also can be used. Judging from foreign press materials, airborne jammers are constantly being modernized and augmented with gear contained in suspended pods. For example, the ELINT and ECM set (the ICAP-2 system) installed on the EA-6B aircraft allows for ELINT operations in a broad spectrum and simultaneous active jamming of enemy radars. Since 1974 this is already the third generation of on-board EW equipment, which should be replaced with a new system in the early 1990's.

*At distances of 1,000-100 km* (primary operating area of deck-based attack and fighter aviation) the primary mission of EW is neutralization of enemy on-board radiotechnical and other means of surveillance, target allocation, and weapon control. As in the previous instance, the greatest load in conducting active EW rests with aviation and other specially assigned forces and resources.

The foreign press notes that it is necessary to rigidly limit the emissions of all ship radiotechnical equipment in the zone in question and use mixed EW resources which should simulate the primary targets rather realistically and provoke the enemy's launch of antiship missiles in false directions. The use in ELINT equipment of foremost achievements in the field of electronics and computer engineering as well as the modular principle of design permitting its rapid modernization by replacement of individual equipment assemblies ensures high effectiveness of ELINT equipment operation. Shortcomings of this equipment include a limited capability to determine enemy coordinates inasmuch as even with the use of triangulation methods for intersecting target positions a need arises for these equipment platforms to exchange radio traffic and consequently the radio silence mode is violated.

A "distraction" or "confusion" mode is used to dispense decoys in the stage of target allocation and target designation (before launch of antiship missiles), in accordance with which up to four sets of combined radar and IR decoys are dispensed in different directions at a distance of 7-12 km (according to other data 1-10 km) from the protected ships. The effect time of this jamming is figured at 1-2 minutes and promptness of dispensing (from the moment the command is issued to the beginning of effective jamming) must not exceed 2 minutes. U.S. Navy ships of various types are outfitted with standard RBOC Mk 33 112-mm and Mk 36 130-mm launchers as well as the Mk 84, Mk 171 and Mk 182 loads for them. This equipment is constantly being improved and its make-up is being augmented.

In addition to passive decoys it is planned to place active repeater-pulse jamming at distances of 1,000-100 km, creating false target images on radar screens displaced in range and/or azimuth relative to the position of the real targets. Depending on specific combat conditions active jamming can be performed by various ships included in the multirole carrier force based on commands from the flagship. In the future it is also planned to use expendable active noise jammers installed in drones for this purpose along with active airborne and shipboard jammers.

*At distances of 100-20 km* (they coincide with ranges of employment of shipboard missile weapons of the multirole carrier force) the carrier force's EW resources accomplish additional missions—suppression of airborne radars and the homing heads of antiship guided missiles before their lock-on of targets for tracking. In addition, they can continue to perform their previous functions completely or partially (depending on combat conditions).

In this case ship weapons and EW resources can be used both in coordination with each other in the interests of the entire multirole carrier force as well as independently by each ship in the form of individual protection against enemy weapons presenting the greatest threat to them.

In the opinion of foreign military specialists, the primary missions of EW and air defense resources of ships in the carrier force at the ranges in question approximate each other. Therefore all technical and visual surveillance resources including radars, which are placed in an active work mode, are used to detect the launches of antiship missiles and to track and destroy them. Information on the shift of enemy airborne radars to a tracking mode (based on pulse repetition frequency) as well as information on detection of a radar homing head's operation or a missile motor jet emission are source data about the launch of an antiship missile received from the ship's ELINT equipment.[3]

Inasmuch as in the initial and middle legs of the antiship missile's flight its homing head has not yet locked onto the target for automatic tracking, the primary mission of decoys is to fall within the field of view of the homing head before the protected ship does. In this sense the tactics of dispensing various types of decoys (including passive antiradar decoys, IR decoys, active decoys for antiradar guided missiles, combination decoys and so on) basically conforms to the "distraction" mode described above, although requirements for operating modes of the jamming and the dispensers are changed: jamming is remoted for a distance of 1-5 km (according to other data, 0.4-5 km) in the direction of the source of

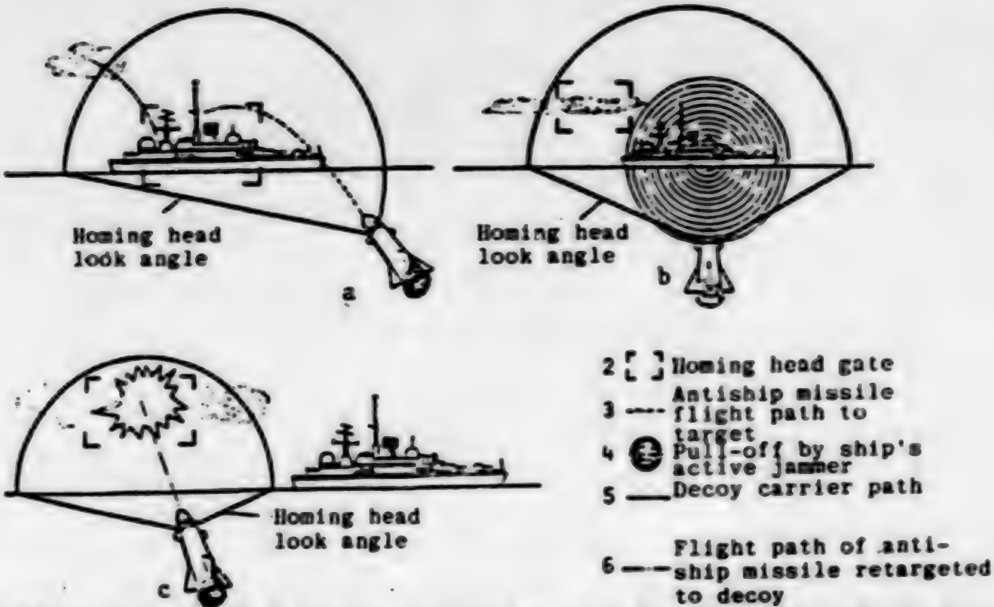


**Fig. 3. Diagram showing jamming in the mode of combined use of passive radar jamming and active jammers:**

Key:
a. Missile is guided to ship
b. Ship's active jammer operates in the mode for creating repeater-pulse jamming which diverts the homing head to the passive jamming (decoy)
c. Antiship missile is retargeted to the decoy

threat, the time of its deployment at the point of placement is reduced to 12 seconds, and the time of effective action (of passive antiradar and IR jamming) is around 30 seconds. The values of emission characteristics can be somewhat less than for the targets they are simulating. Depending on the nature of the antiship missile's flight path, a varying altitude of decoy placement also can be used. As a rule, the jamming mode in this phase is set automatically according to data of the ship's ELINT or NTDS equipment.

In case the antiship missile did not deviate toward the diversionary decoy, shielding jamming can be produced in the form of chaff clouds. The essence of this mode, which is called "attenuation," is that a thick cloud of chaff is placed around a protected ship at a distance of some 400 m to reduce the likelihood that she will be locked onto by the homing head. To obtain the requisite masking effect the cloud must be sufficiently long and dense (radar cross section of at least 1,000 $m^2$). It is believed that under average weather conditions the effective time of this jamming should be 6 minutes. During this period the ship can exit the field of view of the homing head or the antiship missile impact zone. According to the method of tactical employment and nature of operation this mode is close to that of dispensing passive and IR jamming used on the antiship missile's final homing leg.

*At distances less than 20 km* (corresponds to the final leg of the antiship missile's flight path in a target homing mode) EW resources are used for the ship's self-defense together with her SAM and AAA weapons. The mission of EW resources in this case is to disrupt homing and divert the missile to a decoy at a safe distance for the ship.

Two jamming modes have been developed [razrabotat] to counter missiles with radar homing heads at these distances.

The first mode (Fig. 3) provides for the combined use of means of passive radar jamming and active jammers. The chaff cloud or other kind of decoy (this can be IR decoy corner reflectors and so on) is deployed near the ship at a distance not exceeding the width of a homing head's gate pulse (resolution) on the terrain. An active jammer operating in the repeater-pulse jamming mode displaces the homing head's gate pulse to the decoy, which distances itself from the ship in accordance with its movement parameters and wind drift. The foreign press notes that the described method of jamming facilitates retargeting of the antiship missile's homing head to the decoy and provides a maximum reduction in the active jammer's operating time to neutralize one threat source, which is of great importance in repelling mass attacks.

The second mode (Fig. 4) provides for placing a chaff cloud directly above the ship (according to other sources, two clouds with the ship between them) so that at the moment effective action of the jamming begins the cloud or clouds, like the ship, are within limits of the homing

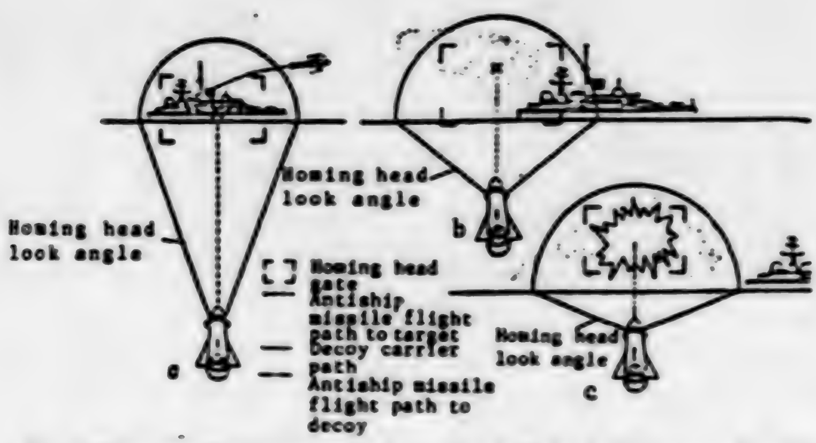


**Fig. 4. Diagram of jamming in the form of a chaff cloud directly over the ship:**

Key:
a. Missile is guided toward ship
b. Guidance axis displaces to jamming with radar cross section (or in the case of IR decoy, with radiant intensity) greater than for the protected ship
c. Antiship missile retargeted to decoy

head's gate pulse. After the ship emerges from the chaff cloud or clouds the homing head continues to track the decoy, which "draws" the homing head to itself because of a larger radar cross section than the ship. It is noted that in this mode there are increased requirements on the amount of radar cross section of decoys and speed of their deployment (reaction speed within the limits of 5-10 seconds). There is also an increased need to consider a large number of factors influencing the effect of the given type of jamming. Among them are motion parameters of the ship and antiship missile, weather conditions, location and nature of actions of neighboring force ships, and so on.

Jamming effect in both described modes can be increased if the ships maneuver while producing the jamming.

Western specialists recommend similar methods to counter missiles with IR homing heads. As already noted, IR decoys are dispensed by the very same launchers as passive antiradar jamming. Inasmuch as it is difficult to create the required level of the IR decoy's excess radiant intensity over the protected ship's emission in the operating bands of the spectrum (3-5 and 8-15 microns), however, it is advisable to cool the ship's hull in the course of jamming by turning on the antinuclear and biological protection sprinkler system. But if the nature of the homing head (IR or radar) cannot be determined, it is proposed to produce both IR and antiradar jamming simultaneously.

According to foreign press data the question of neutralizing television and laser homing heads is still unresolved. One method being developed [razrabatyvat] and tested for combating such homing heads (and at the same time an IR homing head) is a shielding screen based on smoke laid down at a given point in space using a free-flight rocket. It is noted that the screening effect achieved permits substantially reducing emissions passing through the cloud within the entire visible and IR range to 14 microns. The use of off-ship reflectors illuminated from the ship by a laser with the very same emission characteristics as the homing head but of greater power is being considered as a possible method for countering laser systems.

**Footnotes**

1. For more detail on this see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 1, 1982, pp 81-82; No 2, 1983, pp 84-86—Ed.

2. For more detail on this see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 6, 1980, pp 69-73—Ed.

3. For more detail on this see ZARUBEZHNOYE VOYENNOYE OBOZRENIYE, No 12, 1986, pp 66-70—Ed.



6904

## New British Aviation Training Ship

*18010069o Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 67-68*

[Article by Capt 2d Rank Yu. Kravchenko]

[Text] The foreign press reported that the aviation training ship "Argus," refitted from the containership "Contender Bezant" (Fig. 1 [figure not reproduced]), was transferred to the British Navy in the latter half of this year. This vessel was built in Italy in 1981 with a gross register tonnage of 11,455 and a speed of 19 knots. With the beginning of the conflict over the Falkland (Malvinas) Islands she was temporarily chartered by the Defence Ministry from the owner, the Sea Containers Company, and after appropriate refitting which took 5 days she became part of the UK Expeditionary Forces in the South Atlantic. In June 1982 the "Contender Bezant" delivered nine Chinook assault transport helicopters, four Harrier V/STOL aircraft as well as a considerable amount of weapons and combat equipment to the combat zone. The containership made two trips to the Falklands, after which she was returned to the company.

The decision was made in early 1984 to acquire her for the Navy for 13 million pounds sterling and refit her as an aviation training ship. In March of that same year the vessel arrived in Belfast for the necessary work at the yard of the Harland & Wolff Shipbuilding Company. Judging from foreign press data the cost of the refitting contract was 50 million pounds sterling.

The forward superstructure underwent considerable renovation. It was supplemented with a new large block which accommodated living spaces for a considerably increased crew in addition to primary service spaces such as an operations station, communication post, launch control station (for controlling air flights), a space for preflight preparation, and lockers for antiaircraft ammunition and certain other ammunition.

The ship, which was named the "Argus" (Fig. 2 [figure not reproduced]), is fitted with the CANE tactical data control system, which can accomplish various tasks including controlling the flights of aircraft and helicopters, coordinating employment of weapons, and displaying the air, surface and underwater situation at the operations station. Two 20-mm single barrel and two 30-mm twin gun mounts, a sonar countermeasures complex, and free-flight rocket launchers for dispensing Sea Gnat system passive jamming are installed on the ship.

Initially the containership had two smokestacks on each side on small superstructures in the stern. During modernization the port superstructure together with the stack as well as cargo cranes were dismantled and the starboard stack and superstructure shifted in a somewhat altered form closer to the middle of the hull, which permitted creating rather good conditions for equipping a flight deck. A hangar in which three watertight bulkheads are installed is organized beneath the upper deck. Each bulkhead is equipped with a watertight door (9.75 m wide and 6.1 m high) and all of them can be moved by means of a hydraulic drive, which provides an opportunity for moving flying craft within the hangar if necessary.

Spaces for storing aviation munitions, spare parts and other property as well as repair shops are located in the rear starboard side of the hangar. The western press reports that eight V/STOL aircraft and three helicopters can be accommodated in the hangar. There are two aircraft elevators in its forward (starboard) and rear (port) portion. In addition, there is the capability of re-equipping the hangar for accommodating Marines.

Based on the new missions which the ship is to accomplish, during modernization specialists performed considerable work to improve the main power plant (two 11,700 hp diesels), auxiliary machinery and general ship systems. For example, one more diesel generator was installed to provide for increased power requirements. In addition the ship was equipped with systems for remote control and monitoring of power plant operation, for fire extinguishing, and for underway fuel transfer, and she was also equipped with roll stabilizers. The fuel tanks hold 4,436 $m^3$ of diesel fuel and 1,000 $m^3$ of aviation fuel, which makes it possible for the "Argus" to supply fuel to other ships at sea.

The ship's crew grew from 32 to 254 persons, including 137 flight-technical specialists (42 officers). The composition of the air group based on the ship can vary. Foreign military experts state that in the training ship version the group can include six Sea King helicopters for various purposes and in the attack version up to 12 V/STOL aircraft. The foreign press notes that the "Argus" is comparable in capability for basing aircraft with the "Invincible" Class ASW carrier. The performance characteristics of these ships are given below.

| | "Argus" | "Invincible" |
|---|---|---|
| Displacement, tons: | | |
| Standard | 22,256 | 16,000 |
| Full | 28,163 | 19,500 |
| Principal dimensions, m: | | |
| Length | 175.1 | 206.6 |
| Beam | 30.4 | 27.5 |
| Draft | 8.2 | 7.3 |
| Flight deck length, m | 113.5 | 167.8 |
| Maximum speed, knots | 19 | 30 |
| Range, nm | 20,000 | 5,000 |
| At speed, knots | 19 | 18 |
| Can take aboard: | | |
| Sea Harrier aircraft | 12 | 8 |
| Sea King helicopters | 6 | 12 |
| Crew | 254 | 1,000-1,200 |

The British Navy command assumes that based on her characteristics the aviation training ship "Argus" can successfully accomplish many missions, including antiaircraft and antisubmarine defense of convoys on the sea transit, as a training tender for training naval aviation flight-technical personnel, and in landing operations by taking Marines aboard. With the ship's transfer to the British Navy Fleet Auxiliary (home port Portland) it is planned to decommission the K 08 "Engadine" helicopter support ship.



6904

## Japan's Aircraft and Missile Industry

*18010069p Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 69-77*

[Article by A. Yevgenyev and G. Yuryev]

[Text] After Japan's surrender in 1945 special resolutions of the Far Eastern Commission of allied powers completely banned the country's development [razrabotka] and production of military aviation equipment, the 1944 output of which was over 28,000 aircraft and around 40,000 aircraft engines. But as early as 1952, after the separate San Francisco peace treaty was signed between Japan and a number of states headed by the United States, the Japanese Parliament passed the "Law on Aircraft Equipment Production Enterprises," which officially authorized industrial companies not only to produce aircraft, but also to renew interrupted research work.

The impetus for development [razvitiye] of the sector in the mid-1950's came from undertakings to perform repair and renovation work and maintenance on aircraft equipment of the U.S. Armed Forces, which were conducting an aggressive war in Korea. Beginning in 1954, with considerable financial and material assistance from the United States, the country began to unfold licensed production of individual kinds of aviation equipment for military purposes, primarily light aircraft and helicopters capable of accomplishing tactical missions.

Efforts to master the production of rocket technology were made simultaneously with the development [razvitiye] of aircraft construction in Japan. Implementation of a long-term space rocket program, the objective of which was proclaimed as the comprehensive study and development of outer space for peaceful purposes, began in the latter half of the 1950's. Tasks of creating [sozdaniye] rockets and guided missiles for outfitting its own Armed Forces, which were reestablished in 1954, were accomplished in parallel within the scope of the given program.

With the beginning of the 1960's Japanese aircraft construction was developing [razvivatsya] at rapid rates. It was in this period of importance for the sector that there was a considerable expansion and improvement in the production and research base, there was a growth in the number of employed persons and there was an increase in the list of manufactured products and an improvement in their quality. As attested by the Japanese press, licensed production of advanced types of aircraft equipment (fighters, military transport aircraft, helicopters, aircraft engines) was mastered in this "era of prosperity for the aircraft industry." Developments [razrabotka] of flying craft of domestic design began in the research laboratories of Japanese companies in the late 1960's. The most significant event was the conclusion in 1973 of comprehensive work to create [sozdaniye] the first domestic supersonic trainer aircraft, the T-2, which later served as the basis for creating [sozdaniye] the F-1 tactical fighter and an experimental aircraft under the CCV program.

Japan's role in world licensed production of contemporary and future types of aviation equipment stepped up considerably in the 1980's. For example, in 1981 series production began on the F-15 tactical fighters, in 1982 on AH-1S fire support helicopters, in 1983 on P-3C Orion antisubmarine aircraft and in 1984 on CH-47 military transport helicopters. As the annual JAPAN AVIATION DIRECTORY reports, the country presently is carrying out full-scale development [razrabotka] of the SH-X helicopter, intended for replacing the HSS-2B antisubmarine helicopter. In the opinion of Japanese specialists, the increasingly active transition to development [razrabotka] and mastery of production of technically advanced assemblies and components, previously supplied from the United States within the framework of licensing agreements, will provide an opportunity to strengthen independence and improve the sector's competitiveness.

In this regard western analysts note the serious attention given to providing the sector with materials used in the production of aircraft and missile equipment. The country maintains a rather high dependence on supplies of such traditional materials as alloys of certain nonferrous metals and special steels. According to data of the Association of the Japanese Aerospace Industry, five of the largest aircraft and engine building companies in the country import from abroad almost a third of aluminum and titanium alloys and up to 70 percent of special steels used in the production of aircraft and missile equipment.

In addition to the development [razrabotka] of new metal alloys in Japan, much work is done to create [sozdaniye] modern composition materials based on

high-strength carbon fibers, boron fibers, silicon carbide, silicon oxide and so on. In the 1990's it is planned to bring the proportion of composition materials to 50 percent in the overall airframe weight of a future fighter and to almost 100 percent in that of a heavy-lift helicopter.

Japanese and foreign specialists note that despite a relatively small production volume the state gives the aircraft and missile industry (along with the data equipment industry) the role of "main pillar of the national economy of the immediate future." A number of state organizations—the Ministry of International Trade and Industry, the Japan Defense Agency, Ministry of Transport and the Science & Technology Agency give the sector considerable economic support. Each of these organizations has its own sphere of responsibility in production and use of aircraft and missile equipment. For example, the Ministry of International Trade and Industry is responsible for the production of flying craft, the Japan Defense Agency for the purchase of combat aircraft and missile equipment, the Ministry of Transport for its operation and the Science & Technology Agency for development [razrabotka] of technology.

The system of management of Japan's aircraft and missile industry took shape in its present form by the mid-1960's. The Ministry of International Trade and Industry is the basic agency implementing state policy in development [razvitiye] of the aircraft industry and coordinating its foreign relations. The Aviation Equipment Division, a part of this ministry's Heavy Industry Department, issues permits to private companies for organizing the production and repair of aircraft equipment and monitors compliance with corresponding statutes. It also directs the activity of the Aviation and Machine Building Industry Council under the Ministry of International Trade and Industry, which has an Aviation Industry Committee. The latter performs functions of a consultative organ which prepares recommendations on basic directions of the sector's development [razvitiye] in accordance with directions of the Minister of International Trade and Industry.

In addition to the direct recommendations on the part of the Ministry of International Trade and Industry and its organs, the state indirectly influences the development [razvitiye] of all sectors of industry including the aircraft and missile industry through the financial-credit system. In particular, it influences private companies by granting them preferential credits for development [razrabotka] and production of new models of aircraft and missile equipment or by reducing the discount rate percentage in issuing orders needed for expansion and replacement of the sector's fixed capital.

Another factor of state pressure is the price formation mechanism, which functions during direct purchases by the state, chiefly by the Japan Defense Agency, of aircraft and missile equipment.

It should be noted that the Japan Defense Agency is given an important role to play in organizing and monitoring the activities of aircraft and missile industry enterprises inasmuch as military products account for the bulk of all orders in the sector. For example, in this agency's Armament Department there is an Aircraft Division with a guided weapon laboratory which determines Armed Forces' requirements for different kinds of aircraft and missile equipment and which handles questions of deliveries of appropriate materials and documentation, as well as standardization, unification and improving the level of research in the given area.

The Supply Agency, which is directly subordinate to the Japan Defense Agency, handles placement of orders for production of aircraft and missile equipment among private industrial companies and deliveries of that equipment to the troops. It operates in close coordination with the Defense Production Committee of the Federation of Economic Organizations (Keidanren, the principal organ for managing the activities of Japanese monopolies).

Together with the Supply Agency the Defense Production Committee takes part in coordinating military production and it essentially directs activities of the Association of the Japanese Aerospace Industry, which unites over 100 companies engaged in producing aircraft and missile equipment. Without the Defense Production Committee's approval not one major company can receive an order for producing military aircraft and missile equipment. The right to recommend to clients those vying for the conclusion of contracts also is based on Keidanren's comprehensive information on the scientific-technical potential and production base not only of member companies of the Association of the Japanese Aerospace Industry, but also of their foreign partners.

Immediate direction of all activities of sector enterprises is exercised through administrative management staffs of the largest private companies engaged in aircraft and missile equipment production such as Mitsubishi Jukogyo, Kawasaki Jukogyo, Ishikawajima-Harima Jukogyo, Fuji Jukogyo, Shin Meiwa Kogyo, Mitsubishi Denki, Toshiba, Nippon Denki, Nissan Jidosha and so on. As a rule these firms produce the most varied products, with aircraft and missile equipment accounting for from 4 to 20 percent of the overall volume.

These companies' management staffs have divisions or departments directly responsible for production of aircraft and missile equipment. They issue subcontracts to specialized firms for producing individual assemblies and components and they monitor the time periods and quality of their performance. These same divisions and departments are responsible for maintaining business contacts with corresponding state agencies in the area of aircraft and missile construction.

In the opinion of Japanese and foreign specialists, the aircraft and missile industry management system existing in the country has serious flaws retarding the sector's further development [razvitiye]. In particular, due to its complex and multistage nature, parallelism and redundancy appear in the work of individual organs and certain difficulties are seen in the coordinated conduct of planned programs and activities. Therefore in recent years Japan's government and business circles have been discussing the question of creating [sozdaniye] a single state organ handling all matters of development [razrabotka] and production of aircraft and missile equipment.

No less complex is the system which has formed in the country for organizing R&D and tests of aircraft and missile equipment. At the present time tasks of integrated coordination of R&D in the field of aircraft and missile construction are assigned to the Science & Technology Agency, which is organizationally part of the Office of the Prime Minister.

The Aerospace Equipment Research Institute of the Science & Technology Agency is the principal state scientific research organ carrying out R&D in the field of creating [sozdaniye] civilian aircraft. Its associates chiefly support the conduct of basic R&D that is both independent as well as involving the participation of state and private research institutes and laboratories, universities and colleges.

R&D within the framework of military programs is performed in the 3d Research Institute under the Technical Research Center of the Japan Defense Agency (Tachikawa, Tokyo Prefecture). Its principal theme is the development [razrabotka] of military aircraft hulls and engines. Research divisions and labaoratories of the largest private companies participate in almost all projects carried out by the 3d Research Institute in the stage of creation [sozdaniye] and testing of prototypes and their modifications, and as a rule these private companies later become the prime contractors in producing the given type of aircraft and missile equipment.

Japan set an official course toward expanding the participation of specialized consortiums uniting several industrial companies in joint research, development [razrabotka], tests and production of certain kinds of aircraft and missile equipment with a number of leading foreign aircraft and missile construction firms. The activity of these consortiums are financed to a considerable extent (up to 65 percent of the cost of the Japanese share of participation in the projects) from the Ministry of International Trade and Industry budget.

Independently or as part of the consortiums, specialized industrial companies carry out the development [razrabotka] and testing of aircraft, helicopters, missiles, their structural elements, engines, and diagnostics equipment. Within the system of R&D organization in the area of aircraft and missile equipment which has formed in the country the government is forced to assume responsibility for organizing and financing the technically most complex and long-range basic research involving significant nonproductive expenditures. Private companies in turn display greatest activeness in the sphere of applied research, which has a direct outlet to production. The state has the opportunity of rather rigidly controlling the sector's development [razvitiye] in the direction it requires and private capital has an opportunity of avoiding commercial risk and assuring itself in advance of profitable orders for production of aircraft and missile equipment back in its development [razrabotka] stage.

In case of Japan's participation in international projects the aforementioned system permits private companies to pool their S&T potentials and thus successfully oppose more powerful foreign competitors. With such a distribution of roles the state can exert influence on keeping the flight-technical characteristics of products manufactured by the sector at the level of world standards and also promote the active borrowing of foremost foreign experience in R&D.

In production volume the aircraft and missile industry holds a relatively modest place in the country's economy. In 1985 the value of the sector's gross production was around 800 billion yen (0.2 percent of the gross production of the entire processing industry, while for example automobile building accounts for over 10 percent). The number of persons employed was 26,000, which is considerably less than in other sectors (also around 0.2 percent of the processing industry as a whole). According to many basic technical and economic indicators Japan's aircraft and missile industry is significantly inferior to similar sectors of other leading capitalist states. Despite the small production volumes, however, the sector is an important component of the country's military-economic potential inasmuch as military aircraft and missile equipment accounts for over 80 percent of its production.

A characteristic feature of the sector as well as of Japan's military production as a whole is that all production enterprises belong to private companies, and to the largest industrial concerns above all. The fact that in 1985 53 percent of all persons employed in the sector were concentrated in just seven of the largest enterprises with more than 1,000 employees (3.7 percent of the overall total of 188 enterprises producing aircraft and missile equipment) and 75 percent of all products put out by the sector were produced there indicates the high degree of monopolization of capital and concentration of production.

More than 60 plants including assembly plants and engine construction plants comprise the foundation of the sector's production base. Of these over 30 are engaged in producing aircraft and missile equipment for military purposes. A number of enterprises simultaneously assemble both aircraft and missile equipment. The sector is characterized by a high degree of territorial

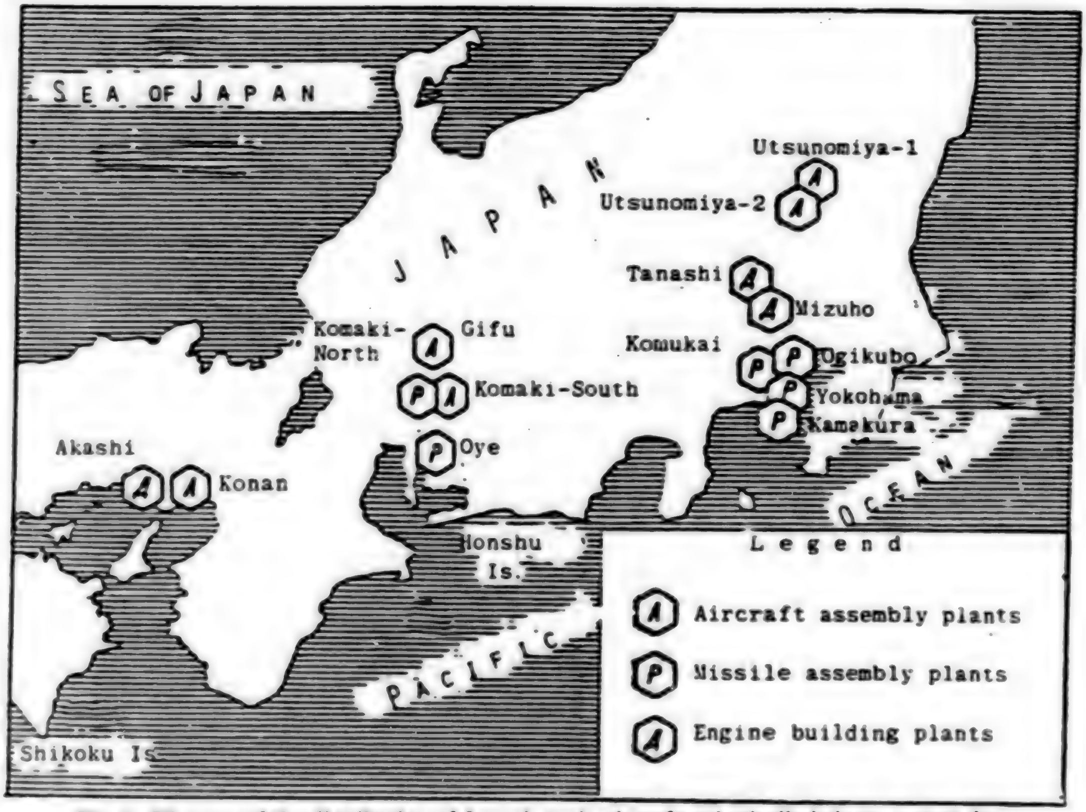


**Fig. 1. Diagram of the distribution of Japan's main aircraft and missile industry enterprises**

concentration. Essentially all plants are located on the island of Honshu, primarily in the vicinity of the cities of Tokyo, Nagoya and Osaka (Fig. 1).

**Mitsubishi Jukogyo's Nagoya Construction Combine** is the largest enterprise in Japan's aircraft and missile industry. Its four plants employ an overall total of more than 6,000 persons. The combine's lead enterprise, the Oye Plant (Nagoya) has around 3,000 workers, engineering-technical personnel and administrative-management personnel. The plant produces a wide product list of components and assemblies for tactical F-15J and F-1 fighters, supersonic T-2 trainers, P-3C Orion land-based patrol aircraft, Boeing 767 passenger liners, MU-2 and MU-300 light utility aircraft, HSS-2 antisubmarine helicopters, as well as series N (Fig. 2 [figure not reproduced]) and H booster rockets for inserting artificial Earth satellites into near-Earth orbit. The plant includes a number of research subunits such as aerodynamics, structural and functional test laboratories as well as a modern laboratory for testing new materials.

The Komaki-South plant (city of Komaki, Aichi Prefecture) has a total of 1,700 employees and is the country's only enterprise for producing (assembling) and repairing fighters and antisubmarine aircraft. The plant has been producing F-15J tactical fighters under license from the American McDonnell Douglas company since 1981. Production of F-1 aircraft and its modifications, T-2 aircraft, HSS-2 helicopters, MU-300 light jets as well as MU-2B turboprop aircraft continues here at the present time.

The Komaki-North plant (city of Komaki, 1,600 employees), which is part of the Nagoya Combine and was considerably expanded in 1986, produces turbofan engines; repairs turboshaft, turboprop and turbojet aircraft engines; produces and repairs helicopter transmissions and aircraft hydraulic systems; assembles rocket engines and produces the Sidewinder air-to-air guided missile under licensing. According to Japanese press reports, Mitsubishi Jukogyo intends to concentrate the principal development [razrabotka] and production of missile equipment including the Patriot SAM system at this plant.

A new plant became part of the combine in 1979—Oye-2 (the settlement of Tobishima, Aichi Prefecture, around 400 employees). Preliminary assembly of F-15J fighter fuselage parts (with subsequent shipment to the Komaki-South assembly plant) as well as of fuselage panels for Boeing 767 passenger liners and MU-300 light jets (with delivery to U.S. assembly enterprises) is organized there.

Mitsubishi Jukogyo has its own test range (Fig. 3 [figure not reproduced]).

The company is presently working actively to create [sozdaniye] new models of aircraft and missile equipment. This includes the XSH-60J antisubmarine helicopter; Japan's first antiship cruise missile, the SSM-1, with an active radar homing head on the terminal leg of the trajectory and a turbojet engine in which composition materials have found rather extensive use; the AAM-3 air-to-air missile; and components and assemblies of the H-2 booster rocket.

Associates of the company's research subunits are taking part in creating [sozdaniye] the V-2500 turbojet engine for medium class widebody passenger aircraft within the scope of an international project with the participation of firms from the United States, Great Britain, the FRG and Italy. Preparation for unfolding production of modern Patriot SAM systems (which will replace the obsolete Nike-J SAM systems) under licensing from the American Ratheon company is in full swing. In April 1985 the Japan Defense Agency announced Mitsubishi Jukogyo as the prime contractor for producing the Patriot SAM system. The beginning of series production of the new missile systems is expected no earlier than 1988 at this company's Komaki-North plant.

**Kawasaki Jukogyo** is second in aircraft production and Japan's largest manufacturer of helicopters. The company's lead aircraft enterprise is the Gifu plant (city of Kagamigahara, Gifu Prefecture, some 3,600 employees). Up to 80 percent of the plant's output is produced on orders from the Japan Defense Agency, including P-3C Orion land-based turboprop patrol aircraft, C-1 military transport jets, the OH-6D, KV-107 and Kawasaki-Hughes 369 helicopters, and assemblies and components for F-15J fighters. CH-47 Chinook transport helicopters have been produced since March 1986 under licensing from the American firm of Boeing Vertol.

In addition, this plant performs repair and maintenance on aircraft equipment being produced at the present time as well as that produced in past decades. In 1978 the enterprise organized series production of Type 79 antitank guided missiles in place of the Type 64 ATGM's removed from the inventory, and in 1981 it began series production of Type 81 SAM airframes (Tan-SAM, Fig. 4 [figure not reproduced]). Production of a future ATGM with semiactive laser homing head is being mastered at the present time.

The Akashi Engine Building Plant of Kawasaki Jukogyo (city of Akashi, Hyogo Prefecture, around 4,300 employees, Fig. 5 [figure not reproduced]) assembles the T55-K-712 turboshaft engines for CH-47 Chinook transport helicopters, the T53-K-703 for AH-1S Cobra-TOW antitank helicopters, as well as the T53-K-13B for UH-1B Iroquois multipurpose helicopters. In addition the plant mastered production of the most important components for F100 turbojet bypass engines for F-15J tactical fighters. In addition to aircraft engines, the plant presently has organized the manufacture of ship gas-turbine plants for guided missile destroyers.

One of the latest joint developments [razrabotka] in aircraft equipment in which specialists of Kawasaki Jukogyo and the Aerospace Equipment Research Institute of Japan's Science & Technology Agency took part is the Asuka STOL cargo and passenger aircraft, with the basis of its design being the C-1 transport aircraft.

**Fuji Jukogyo's** Utsunomiya-1 aircraft plant (city of Utsunomimya, 3,100 employees) produces the FA-200 light piston-engine aircraft, KM-2 multipurpose trainer, as well as assembly and machine units for F-15J, P-3C and Boeing 767 aircraft and UH-1B and AH-1S helicopters as well as launchers for Type 81 SAM's.

In the early 1980's Fuji Jukogyo built a new plant, Utsunomiya-2, in the city of Utsunomiya for the purpose of setting up production of new AH-1S antitank helicopters under license from the American Bell Corporation. At the present time this plant also produces and repairs UH-1B helicopters. The small number of employees in this enterprise (around 150) indicates the rather high degree of mechanization and automation of production processes.

**Shin Meiwa Kogyo's** Konan plant (city of Kobe, around 800 employees) is known as one of the world's few enterprises specializing in the production of flying boats. The plant supplies the Japanese Navy with US-1A turboprop search and rescue seaplanes. In addition, the plant performs a number of domestic subcontract jobs for producing the most important kinds of aircraft equipment including for the F-15J, P-3C, C-1 and Boeing 767 as well as the advanced XT-4 trainer.

**Ishikawajima-Harima Jukogyo's** Mizuho Plant (located in the settlement of Mizuho, Tokyo Prefecture), 1,400 employees, is the country's only enterprise for production and testing of F-100-IHI-100, J79-IHI-17, J3-IHI-7 and TF-IHI-801A turbojet engines, CT58-IHI-110, T58-IHI-8B and CT58-IHI-10 turboshaft engines and T64-IHI-10 and T56-IHI-14 turboprop engines as well as for the manufacture and repair of gas turbine engine control units.

The Tanashi Plant (city of Tanashi, 1,700 employees) and Kure-2 Plant (city of Kure, Hiroshima Prefecture, 500 employees) are primary suppliers of machine units and assemblies for this assembly enterprise. Lately they have been involved more and more widely in implementing Japan's space rocket program. This is indicated by placement of new orders for production of modern rocket equipment systems and assemblies and various gear to be installed in satellites, including for machining in outer space.

The most sophisticated models of missile equipment are assembled at enterprises of large electronics companies. This is dictated on the one hand by the rather high proportion of electronics in the overall cost of the systems (up to 70 percent) and on the other hand by the broad opportunity for introducing electronic assemblies

and systems (minicomputers, integrated circuits, control units) previously developed [razrabotat] for civilian articles in advanced rocket systems. For example, Mitsubishi Denki accounts for around 70 percent of the cost volume of missile equipment produced in Japan and Toshiba accounts for up to 17 percent.

**Toshiba** electronics company is the prime contractor in producing the Improved Hawk and Type 81 SAM systems. Subcontract work is performed by the companies of Nissan Jidosha, Kawasaki Jukogyo, Asahi Kizai, Nippon Yushi, Daikin Kogyo, Nippon Musen, Tugoku Kayaku and Nippon Denki. **Mitsubishi Denki** Electric Corporation plays an important role in producing the Improved Hawk SAM system. It also produces the AIM-7E Sparrow air-to-air guided missile and Sea Sparrow SAM. Subcontracts are distributed among Nippon Hikoki, Nissan Jidosha, Daiseru Kagaku Kogyo and Asahi Kizai. The corporation's enterprises basically produce (and in some cases also develop [razrabotka]) individual missile subsystems (guidance systems, nose cones, rocket engines) and their components and assemblies which go to make up sets.

The largest enterprises engaged in manufacturing missile systems as end military products are Toshiba's Komukai Plant, Mitsubishi Denki's Kamakura Combine, Nissan Jidosha's Ogikubo Plant as well as the aforementioned Gifu Plant which produces antitank guided missiles.

The Komukai Plant (city of Kawasaki, Kanagawa Prefecture) has 2,900 employees, of whom 1,700 produce special electronics and radars (chiefly for military purposes) and assemble tactical missile equipment. The plant also has organized the assembly of Improved Hawk SAM's (airframes and equipped rocket engines for these are supplied by the Ogikubo Plant). Solid propellant for these engines comes from the Harima Plant of Daiseru Kagaku Kogyo. Nose cones for the SAM's are supplied to assembly shops of the Komukai Plant by the Yodogawa Combine. The guidance system for the Improved Hawk and Type 81 SAM's including radar and ground electronics are produced directly at the Komukai Plant.

The Kamakura Combine (city of Kamakura, 4,000 employees) is a specialized enterprise for assembling Improved Hawk SAM's. A special shop of the combine produces active radar homing heads for Type 80 antiship missiles and assembles the AIM-7E and 7F air-to-air guided missiles and Sea Sparrow SAM's.

The Ogikubo Plant (city of Tokyo, 1,500 employees) is one of the leading enterprises of Japanese missile construction which accounts for over 90 percent of the value of all free-flight rockets manufactured in the country. It also produces rocket engines for SAM's and for certain types of air-launched guided missiles.

**Nippon Denki's** Yokohama Plant (3,800 employees) basically specializes in creating [sozdaniye] communications equipment, including for military purposes. In 1983 it mastered the licensed production of TOW wire-guided ATGM's for equipping the AH-1S Cobra-TOW helicopters brought into the inventory. According to Japanese press reports, the plant plans to produce the Stinger shoulder-launched SAM system in the early 1990's.

In the opinion of foreign military specialists Japan's aircraft and missile industry is moving to the level of contemporary standards of the capitalist world in some directions of development [razrabotka] and production of technically sophisticated functional assemblies and systems. The sector presently has entered a period of intensive development [razvitiye] characterized by comprehensive activation of R&D, an improvement in technology, and an increase in science-intensiveness of products and in the qualification level of scientific-technical personnel and production workers.

Developing the production of modern military aircraft and missile equipment by side-stepping provisions of the country's constitution is a substantial destabilizing factor in the matter of detente in the far-eastern region.



6904

## U.S. Marine Temporary Airfields

*18010069q Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 81-85*

[Article by Capt 2d Rank V. Malov]

[Text] In its aggressive aspirations for world domination the U.S. military-political leadership places great emphasis on increasing the combat effectiveness and mobility of the Marines, one of the basic components of the interventionist Rapid Deployment Force. An important direction for improving their combat effectiveness and mobility is the resolution of problems of basing Marine aviation in areas of aggression, especially in initial stages of an amphibious landing operation in a poorly prepared theater of military operations. It is presumed that either there will be no airfields at all in an amphibious assault force landing area or they will be partially demolished during strikes by carrier-based aircraft in preparation for the assault force landing. Therefore the rapid construction of temporary airfields for Marine aviation, which the foreign literature calls expeditionary airfields (EAF), will be required to ensure air support for the assault force.

The American Navy ran up against a real need for building temporary airfields for the first time in the initial stage of Marine involvement in the aggression in Southeast Asia when it was forced to build such a facility at Chu Lai (South Vietnam) in May 1965. Initially in building the airfield it was decided to use a specially

developed [razrabotat] set of equipment, the SATS (Short Airfield for Tactical Support). This included sectional metal surface mats for a runway, taxiways, and group hardstands for aircraft; an aircraft catapult system for the take-off; arresting gear to stop aircraft in a landing; an emergency braking unit; take-off and landing control system; illumination engineering equipment; equipment for replenishing POL; prefabricated and dismountable hangar shelters, and so on.

According to American specialists such equipment permitted building a 600x18 m runway and supported flights of aircraft weighing up to 28 tons. It could be installed by a naval construction battalion in 50 hours. But in case the catapult or arresting gear is damaged, such a runway will be impossible to use for the majority of Marine aviation aircraft. In addition, even when serviceable the airfield will not be able to be used by Air Force tactical aviation, in which aircraft are not equipped with a landing hook for the arresting gear. Therefore a 1,219x29.3 m runway was developed [razrabotat] and later lengthened to 2,438 m. The airfield at Chu Lai was built in 25 days by a naval construction battalion using Marine combat engineers. Presently such time periods for building temporary airfields no longer satisfy the Marine command and so new requirements were drawn up. In the opinion of specialists such an airfield should allow the basing of at least one squadron of support aircraft, be ready for use in the first 3-5 days of an assault landing and function for at least 30 days while the assault force is conducting combat actions ashore. In addition it must be air transportable and capable of being quickly dismantled if necessary.

In connection with the extensive use of aircraft of different purposes (jet, prop, V/STOL) as well as helicopters in Marine aviation, several standard sets of airfield equipment were developed [razrabotat]. In the opinion of the naval command, this permits the Marines to deploy airfields for helicopters and V/STOL aircraft almost immediately after the assault force's first wave lands and then expand them to support the basing of Air Force tactical aviation and the landing of heavy transport aircraft. Temporary airfields organized in beachheads are divided into five types according to the accepted classification (see table).

| Type Airfield | Number of Sets/Total Area of Sectional Surface, $m^2$ For Air Squadron | For Air Wing |
|---|---|---|
| Forward landing pad | — | 6/2900 |
| Landing pad | 1/2285 | 3 |
| Temporary airfield for V/STOL aircraft | — | 1/69,765 |
| Temporary airfield | - | 1/210,660 |
| "Strategic" airfield* | — | — |

*One set of equipment is at the immediate disposal of the Marine command.

**The forward landing pad 22x22 m in size is assembled from sectional mats and intended for accommodating one V/STOL aircraft or helicopter. It is a base building block for subsequent creation [sozdaniye] of an airfield. A complete set of its equipment weighing 29 tons and with a volume of 42.2 $m^3$ can be delivered ashore to the assembly site in helicopters.**

The **landing pad** including a 182x22 m runway and a group hardstand for six V/STOL aircraft (total area 2,285 $m^2$) is intended for basing a Marine air squadron. The full set of equipment weighs 622 tons. It has a volume of 1,050 $m^3$ and permits performing limited aircraft equipment maintenance.

The **temporary airfield for V/STOL aircraft** includes a 594x22 m runway and group hardstand (total area 69,765 $m^2$) for 36 aircraft and helicopters. It can base an air group. The full set of equipment weighs 1,866 tons and has a volume of 3,125 $m^3$. The airfield has equipment for combat aircraft maintenance, for meteorological support and for air traffic control under all weather conditions.

The **temporary airfield** with a 1,585x29.3 m runway and group hardstand for 88 aircraft and helicopters (total area 210,600 $m^2$) is intended for basing one or more air groups of a Marine aircraft wing. The full set of equipment, which weighs 4,460 tons and has a volume of 5,910 $m^3$, includes arresting gear and radio navigation, illumination engineering and communications equipment supporting all-weather flights day or night. There is one in each Marine aircraft wing.

The **"strategic airfield"** (called that in the foreign literature because it can accept Marine aircraft of all types and heavy C-141B Starlifter and C-5A Galaxy transports of the Air Force Military Airlift Command for supplying the assault forces) has a 2,438x29.3 m (or 45.7 m) runway and a group hardstand for 96 tactical aircraft and helicopters. Its total area is 242,200 $m^2$. Several air groups or an entire aircraft wing can be based at the airfield. The full set of equipment weighs 8,120 tons and has a volume of 13,655 $m^3$. It permits flights in any weather day or night and basic kinds of aircraft equipment maintenance. Such an airfield usually is deployed after all assault forces have landed. Its equipment set is stored in a depot in the continental United States.

Equipment sets of temporary airfields (landing pads) of the first four types usually are delivered to the assault landing area aboard vessels of the first echelon of the landing force and the "strategic" airfield aboard vessels of the rear echelon.

The set of equipment of temporary airfields and landing pads includes a number of standard components, the most important of which are the sectional surface, portable illumination engineering equipment, arresting gear, and the system for aircraft homing and landing under adverse weather conditions and at night.

The *sectional surface* consists of AM-2 shaped aluminum mats from which a runway, taxiways and hardstands can be quickly assembled. Such mats are standard and are widely used in constructing temporary airfields for U.S. Air Force tactical aviation. The surface is designed for the operation of jet aircraft with single-wheel main landing gear strutts for which the load on one wheel is up to 12,250 kg, tire pressure is up to 28 kg/cm$^2$, the dynamic load created by the aircraft is no more than 40.86 tons and the pressure from impact of the tail hook of aircraft using arresting gear in the landing is no more than 1,055 kg/cm$^2$. The AM-2 mat is 3,660 mm long, 610 mm wide, 38 mm thick and weighs 65.3 kg. Its surface is coated with a special compound to increase the friction coefficient. To increase surface rigidity the mats are laid with a displacement of half their length. Therefore half-mats 1,830x610 mm in size are produced to fill in the gaps at the ends of the strip.

Mats are transported in blocks of 12. Preparation of a dirt bed is required for prolonged intensive use of runways made from AM-2's. If the soil is hard mats can be laid directly on it after preliminary leveling. Special treatment with cement to a depth of 18-20 cm must be performed to reinforce it if there is soft or loose soil and depending on weather conditions in the airfield area, but this leads to an increase in construction time. For example, in constructing the airfield at Chu Lai on coastal sandy soil the upper layer of the runway's dirt bed was covered with a layer of soil cement (8 percent cement) around 18 cm thick and subsequently during the airfield's operation the Americans were forced to treat the soil cement surface with diluted bitumen (3.2 l/m$^2$). Mats were laid three days later and flights began no earlier than in seven days.

*Portable illumination engineering equipment* powered from special generators can be quickly installed at the airfield. Its individual components can be installed in various stages of construction. The full set of equipment includes an airfield light beacon, landing approach lights, glide indicator, and lighting fixtures to illuminate the runway and approach strips and for marking the beginning and end of the runway, obstacles and taxiways. The illumination engineering landing system supports the visual landing of aircraft. Depending on their type, temporary airfields use from one to three sets of Mk 8 Mod 0 systems mounted on a trailer.

*Arresting gear* is intended for rapidly killing aircraft landing speed. M-21 arresting gear is used at temporary airfields; four sets—two main sets and two emergency sets—are used at each airfield.

The *system for aircraft homing and landing* in adverse weather conditions and at night includes the AN/TPN-16 and -33 nondirectional radio beacons, AN/TPS-63 surveillance (air traffic control) radars, AN/TPS-68 meteorological radars, AN/TPN-29 TACAN short-range navigation system radio beacons, AN/TPN-8A and -19 landing radars, MRAALS portable instrument landing system (weighing 36 kg) and AN/TRC-131A communication radios. A new (containerized) air traffic control and landing system, the MATCALS (Marine Air Traffic Control And Landing System), has been developed [razrabotat] for use at airfields. It is similar to the AN/SPN-42 landing system (accommodated on carriers) and permits controlling the landing of six aircraft simultaneously. The system (Fig. 1 [figure not reproduced]) includes the AN/TPN-22 all-weather landing subsystem (effective range to 18 km), the AN/TSQ-107 air traffic control subsystem, AN/TPS-63 surveillance radar and AN/TSQ-131 command and control subsystem. All this equipment can be deployed by attendant personnel in 1-2 hours.

The U.S. Marine command presently uses two temporary airfields for training flight crews and airfield maintenance subunit personnel. The airfield at the Marine Training Center at Twentynine Palms, California (Fig. 2 [figure not reproduced]) is the primary training complex and is used widely during Marine exercises as well as in exercises with the Army and Air Force. From the time the airfield began functioning in June 1976 through September 1981 just the C-141 Starlifter transports with a flying weight of around 120 tons have made almost 1,600 landings. The Marine auxiliary airfield at Bogue Field, North Carolina has been in operation since the early 1960's and is used chiefly by personnel of naval construction battalions and Marine combat engineer battalions for practice in setting up airfields on the terrain.

Materials published abroad recommend building temporary airfields in coastal areas, on coastal islands and on territory occupied by friendly forces near the area where an amphibious landing operation is carried out. With demolished enemy temporary airfields located near the area of an operation it is advisable to build Marine airfields at their location. This will considerably facilitate work and reduce time periods for their creation [sozdaniye] inasmuch as these areas usually are drained and have protected approaches as well as leveled ground for the runway and access roads.



6904

## U.S.-Canadian Torpedo Range

*18010069r Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 85-86*

[Article by Col N. Sterkin]

[Text] In the course of intensive preparation for naval warfare the U.S. Navy command is giving unremitting attention to a quantitative build-up and qualitative improvement in different kinds of underwater ordnance

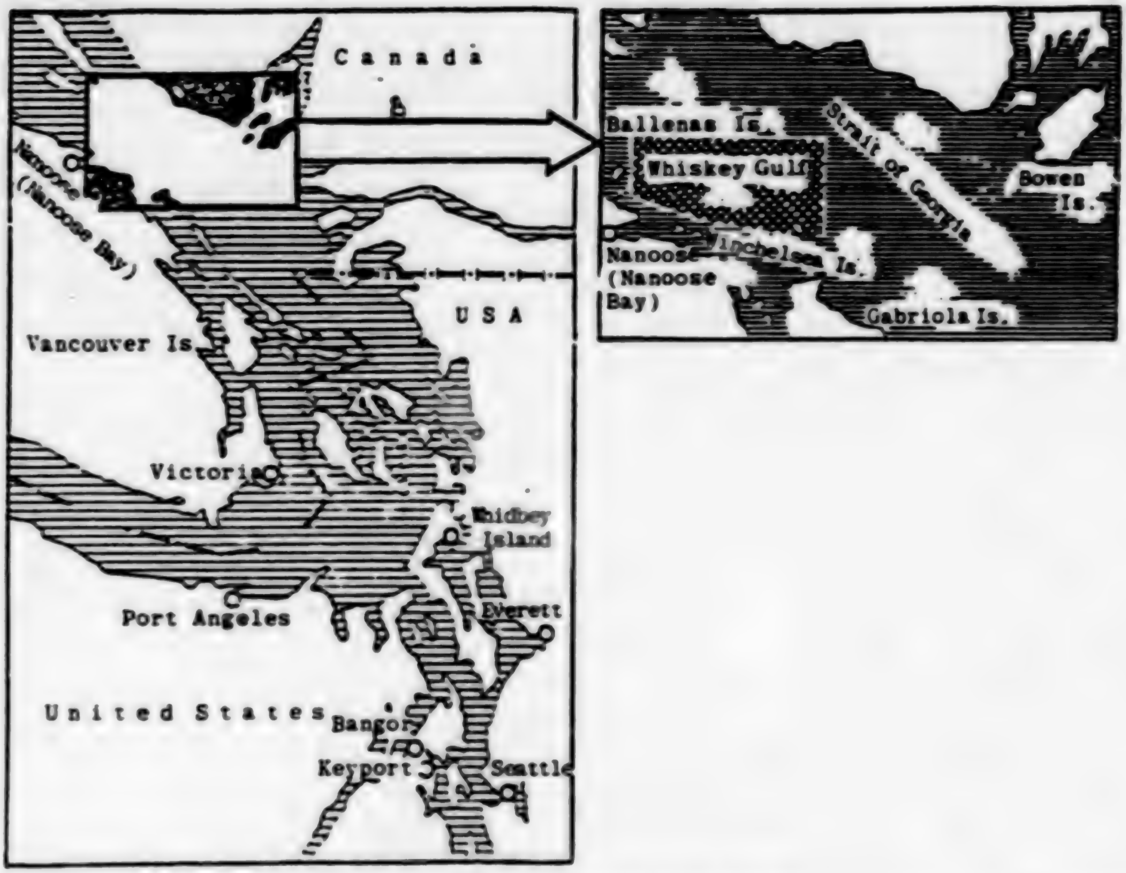


**Fig. 1. Diagram of the torpedo range location**

including torpedoes. More than 20 ranges and test facilities have been established in the United States to test torpedo prototypes and series-produced articles. Most of the ranges are located in the country's territorial waters, but some also are outside national limits.

A prominent place among the latter is held by the joint U.S.-Canadian torpedo range in the Strait of Georgia near the northeastern coast of Vancouver Island near Nanoose Bay. It was established in 1965 after naval experts of both countries concluded that the two American ranges (both in the state of Washington) and one Canadian range (not far from the city of Victoria, Vancouver Island) previously operated did not provide necessary conditions for testing modern torpedo ordnance. The new range complex in Nanoose Bay (Fig. 1) included a sector of Whiskey Gulf Strait for conducting tests, the small Winchelsea and Ballenas islands, and the populated point of Ranch Point on the shore of Nanoose Bay.

This range is located in Canadian territorial waters and legally belongs to its Armed Forces, which formally exercise control over its activities. The U.S. Navy leases the range on the basis of a special agreement. This document spells out the procedure for joint operation, in accordance with which each party is given an identical amount of time for performing tests. In fact, as the foreign press attests, the senior NATO bloc partner takes the lion's share of it. Each year here over 1,600 torpedoes are fired from underwater and above-water tubes or dropped from aircraft and helicopters.

The principal part of the range—Whiskey Gulf—is 24 km long, has a width of from 3 to 8 km and occupies an area of around 130 $km^2$ with depths of 300-450 m, and the bottom is muddy. Twenty-four sonar antennas (each with four hydrophones) are placed on the bottom. The Winchelsea Islands are a small, barren, rocky ridge rising almost 30 m above the water. A computer is installed in a specially built building on one of the islands to which appropriate data are transmitted from the acoustic units. The location of an object and its course, speed and depth are determined from processing the data. Naval specialists establish the conformity of actual performance characteristics to design characteristics. During tests 15-20 specialists brought in from Ranch Point support the operation of this gear.

A helicopter pad, a small berth and an observation post with instruments for visual and radar surveillance of

torpedoes have been built and appropriate antennas deployed not far from the computer building.

If necessary, visual control also can be exercised from an additional observation post on one of the Ballenas Islands, from which the main surveillance direction is perpendicular to that from the main observation post. A supply base for the test complex has been set up on an area of around 250 hectares at Ranch Point. Helicopters and torpedo recovery boats are attached to the range. The latter recover torpedoes which have surfaced after running the desired distance (Fig. 2 [figure not reproduced]).

The American side supplies everything necessary for the equipment complex to function and provides for its maintenance. Canadians who have trained under the direction of U.S. Navy specialists also are used for this. The Canadian side is responsible for range security. Overall organization of tests is formally assigned to the Canadian range staff at Ranch Point, but in fact all problems are resolved by the American staff also located there.

Some 100 Canadians and approximately 90 Americans constantly work at the range. A large number of the Canadians are civilians, while servicemen predominate among the Americans. In addition, up to 200 U.S. civilians perform temporary missions during the year at Ranch Point. Primarily these are naval specialists from the American Underwater Ordnance Station in Keyport, Washington.

According to the western press, intensive tests usually last 5-7 weeks at intervals of 1.5-2.5 months. Additional torpedo recovery boats come from Keyport for the period of the tests (the transit takes 10-13 hours).

One of the test ships from which torpedoes are launched is the former supply ship "New Bedford." A single torpedo tube from a diesel submarine is installed on her (up to 10 torpedoes are taken aboard). Her displacement is 935 tons, principal dimensions are 53.8x10x3.1 m and she has a crew of 21. As many as another 35 specialists can be aboard during tests. In 1985 some 350 launches were made from the "New Bedford." The ship has the CURV-2 (Captive Underwater Recovery Vehicle) unmanned submersible with an operating depth of 760 m for hunting and recovering torpedoes which sank during tests. A motor, sonar, TV camera, lights and movable clamps are installed in the submersible.

Active use of the Nanoose torpedo range by the United States is yet further proof of unending efforts to improve underwater ordnance for the Navy.



6904

## Austrian SM-4 Mortar

*18010069s Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 87-88*

[Article by Lt Col V. Nesterenko]

[Text] The Austrian firms of Vereinigte Edelstahlwerke and Noricum developed [razrabotat] on their own a prototype of the SM-4 120-mm four-barrel self-propelled mortar (see figure [figure not reproduced]), intended for fire support of infantry subunits and for countermortar fire. The foreign military press reports that the mortar is mounted on the cargo bed of the five-ton Unimog vehicle of the West German firm of Mercedes-Benz. It has four smoothbore barrels, each 3 m long and connected by a common frame, a common 2,000x1,000 mm baseplate (capable of withstanding a load of up to 360 tons), a pneumatic trigger mechanism, as well as hydraulic mechanisms for laying, elevating and lowering the artillery part. Two hydraulic stops located in the rear of the chassis provide a stable position of the self-propelled mount when being laid on the target and during fire.

The chassis and artillery part weighs 7 tons and there is a crew of three. The vehicle cargo bed also accommodates the basic unit of fire (60 mortar rounds). The SM-4 mortar usually is fired in a salvo (to a range of up to 11.5 km). The rate of fire by that method reaches 24 rounds per minute. It takes 1.5 minutes to shift from a traveling to a firing position, including laying on the target, and the mortar can leave the firing position 20 seconds after ceasing fire. Maximum speed is 100 km/hr and the range is 500 km.

According to foreign press data the Austrian developing [razrabotchitsy] firms plan to outfit the self-propelled mortar with an automatic loader, which will permit firing using a remote control panel. They also are developing [razrabatyvat] precision and cluster rounds for engaging armored targets.



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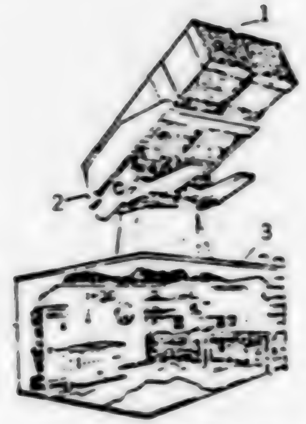
## Storm Shipboard Multiple Launch Rocket System

*18010069t Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 89-90*

[Article by Capt 2d Rank (Res) V. Mosalev]

[Text] According to a western press report, the French firm of Creusot-Loire is developing [razrabatyvat] the Storm shipboard modular multiple launch rocket system [MLRS] intended for firing against shore targets and dispensing chaff and infrared decoys. The system can be quickly installed on ships of different types and on medium-displacement auxiliary and civilian vessels. It is




**Storm shipboard multiple launch system:**

Key:
1. Launcher-containers
2. Stabilized rotating platform
3. Fire control post container-hut

a removable fire control post container-hut (see figure) easily fastened to the deck and accommodates a launcher in the form of a gyrostabilized rotating platform with two expendable rocket launcher clusters.

A fixed version of the system also is planned in which the launcher is mounted on deck and the fire control equipment is accommodated in an internal ship space. Each cluster (3.4 m long, 1 m wide, 0.82 m high and weighing 2.5 tons) loaded with rockets contains 18 launching tubes in an aluminum case. The intervals between the case and tubes are filled with polyurethane foam filler. The clusters are fastened on a rotating platform having angles of elevation up to 60 degrees and angles of deflection within the limits of a 320 degree sector. The height of the stabilized platform (less the launcher cluster) is 2 m, the diameter of the turning circle is 3.4 m, and the weight is 3.3 tons; with mounted launchers the figures are 2.3 m, 5 m and 8.3 tons respectively. The launchers are reloaded by simply replacing the launcher clusters using a ship or shore crane. In the future it is planned to use a semiautomatic reloading system.

The Storm's volley fire system uses solid propellant free-flight rockets (3,311 mm long, with a diameter of 160 mm and weight of 110 kg). The maximum range of fire is 30 km. The free-flight rocket warhead weighing 50 kg can be filled with a charge of conventional explosives (high explosive-fragmentation) or with clusters of mines, flares, chaff or infrared decoys. The free-flight rocket has a folding cruciform stabilizer which opens when the rocket leaves the tube.

In case of positive results from tests of the Storm system, planned for 1988, a decision will be made on its series production and delivery to ships.



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## Foreign Military Chronicle

*18010069u Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 12, Dec 87 (signed to press 7 Dec 87) pp 91-92*

[Text] **United States**

•Gen A. Gray was appointed Commandant of the Marine Corps in place of Gen P. Kelley, who retired (after 37 years on active military duty and 4 years in that position). Gray is 59 years old, has served 35 years, and his last position was Commanding General, Fleet Marine Force Atlantic.

•Production has begun on the M9 general-purpose engineer vehicle intended for making passages in obstructions and demolished areas, trail blazing, and digging antitank ditches and shelters for tanks and artillery systems. The tool is a bulldozer blade. It has a winch with a pull of 11 tons. It was planned to deliver 21 vehicles in early 1988. A total of 500 such vehicles have been ordered for the U.S. Army Engineer Troops.

•The CATFAE (Catapult Launched Fuel-Air Explosive) mineclearing rocket system using fuel-air explosive munitions for making passages in minefields is undergoing tests. The system launcher (21 munitions) is contained in the assault compartment of the LVTP-7A amphibian tractor. The CATFAE mades a passage 300 m long and 20 m wide.

•Flight tests of a reconnaissance version of the F/A-18R Hornet fighter-attack aircraft are under way at Patuxent Naval Air Station, Maryland. It is expected that these aircraft will replace the RF-4B Phantom aircraft in U.S. Marine Aviation in the early 1990's.

•During tests of over-the-horizon radars in late 1987 and early 1988 it is planned to begin using Type 147 drones to simulate the flight of cruise missiles. To this end it is planned to demothball over 50 such drones and prepare them for flights which will be conducted by the U.S. Air Force 6514th Test Squadron (Hill Air Force Base, Utah). These drones were developed [razrabotat] by the American firm of Teledyne Ryan and widely used in combat actions in Southeast Asia chiefly for conducting aerial reconnaissance.

•The first of six integrated aircraft trainers ordered for training the crews of C-5B heavy military transport aircraft has been installed at Altus Air Force Base, Oklahoma and placed in operation. The remaiing five are to be placed in operation in early 1988.

*A new version of the Harpoon antiship missile has been developed [razrabotat] by the firm of McDonnell Douglas intended for firing against naval targets from shore. The antiship missile launcher is accommodated on a five-ton truck. Target data will come either from a radar also mounted on the truck or from another radar.

*Supporting the escort of vessels and showing the military might of the Navy in the Persian Gulf is costing the country's taxpayers an additional $15-20 million per month (over funds already allocated in the budget for combat training and logistics).

**Great Britain**

*Lt Gen P. Inge was appointed commander of I Army Corps (stationed in the FRG) in August 1987.

*LAW-80 94-mm handheld antitank rocket launchers are being delivered to the Army. They will replace the Swedish Carl Gustav and American M72 antitank weapons. The new weapon can be used to engage armored targets at distances up to 500 m. Armor penetration is around 600 mm. These antitank rocket launchers also have been purchased by Jordan.

*The D 20 "Fife" guided missile destroyer and the diesel submarines S 08 "Walrus" and S 09 "Oberon" have been decommissioned. They are expected to be sold abroad after repair.

*It is planned to build a special vessel with launcher for launching satellites using Atlas, Titan and Delta rockets (within the scope of the SDI program). The prime contractor is the British firm of CSI North Venture. Construction will begin in 1988 at the Harland & Wolff yard in Belfast, Northern Ireland. The vessel's displacement is 500,000 tons and she is over 400 m long. When rockets are launched the vessel is fixed using bow and stern anchors or hydraulic checking devices, or by filling ballast tanks and grounding (the specific method has not yet been chosen). It is planned to launch rockets from coastal waters of islands situated near the equator. The principal users of the vessel will be the American firms McDonnell Douglas, Martin Marietta and General Electric.

*Construction is ending on a series of "Brecon" Class minesweepers/minehunters. Eleven ships already have been handed over to the Navy (the 1st and 3d minesweeper squadrons) and two are under construction. The ships' full displacement is 725 tons, they have a length of 57.6 m, a beam of 10 m, a draft of 3.4 m, the twin-shaft diesel power plant output is 3,800 hp, speed is 16 knots, and range is 1,500 nm at a speed of 12 knots. They have a crew of 45, including 6 officers. The ships have modern types of sweeps, two PAP 104 submersibles, Type 2093 minehunting sonar, and single-barrel 40-mm gun mount.

**FRG**

*The following were appointed as of 1 October 1987:

—Lt Gen Horst Jungkurth, who previously held the post of deputy inspector general of the Bundeswehr, Inspector (CIC) of the FRG Luftwaffe;

—Maj Gen Siegfried Pacholke, who had been chief of staff of the FRG Luftwaffe Tactical Air Command, CIC of the FRG Luftwaffe Training Command;

—Maj Gen Klaus Rimmek, who previously headed the NATO AWACS command, commander of 3d Air Support Division;

—Lt Gen Walther Schmitz, who had been CIC of 4th JTAC of Allied Air Forces Central Europe, chief of general affairs directorate of FRG Luftwaffe;

—Maj Gen Karl Sasse, previously chief of a directorate of FRG Luftwaffe main staff, commander of 4th Air Defense Division.

*The first MIRA thermal imaging sights to be mounted on the Milan antitank missile system for conducting night fire have been delivered to the Army. A total of 1,300 such sights have been ordered for the Bundeswehr, with deliveries to last until the end of 1988.

*Flight tests have begun on a high-altitude reconnaissance aircraft created [sozdat] on the basis of the G-109 powered glider. In the opinion of West German specialists, the new aircraft, essentially made completely from composition materials, will be able to provide observation of the territory of states contiguous with the FRG to a depth up to 55 km when flying (along the border) at altitudes of 15-18 km with the help of modern electronic reconnaissance equipment. The Luftwaffe command intends to form a reconnaissance squadron which will have 8-10 such aircraft.

**France**

*Corps General of Aviation Philippe Vougny was appointed CIC of the Forces Aviennes Strategiques [Strategic Air Command] as of 1 September 1987.

*The firm of Panhard will deliver the first series-produced VBL 4x4 armored vehicles to the Army in the first half of 1988. The program provides for producing a total of 3,000 vehicles in two versions—1,000 antitank (armed with the Milan antitank missile system) and 2,000 combat reconnaissance (armed with the 7.62-mm or 12.7-mm machinegun).

*A fourth E-3A airborne early warning and control aircraft has been ordered from the American firm of Boeing (a contract for delivery of the first three such aircraft was signed in February 1987). All four E-3A's are to be handed over to the French Air Force in 1991.

**Italy**

•The OD/82 hand grenade has been adopted by the Army. Its characteristics are an overall weight of 280 g, weight of explosive 112 g, height 83 mm, diameter 59 mm and effective antipersonnel radius (with fragments) up to 5 m.

**Turkey**

•A contract was concluded with the American firm of CONTEL Page to deliver mobile communications equipment for subunits and units of the 2d and 3d field armies. It is planned to spend $90 million for this, which will come from NATO funds.

**NATO**

•An exercise of artillery subunits of NATO's mobile ground forces was held at a British range in mid-1987 which included American, British, Belgian, West German and Italian batteries as well as a Luxembourg mortar platoon. The foreign press emphasizes that the joint firings were successful despite the diversity in artillery armament. A British headquarters battery exercised fire control. Firing positions were changed using helicopters.

•Central Enterprise-87, the annual exercise of NATO Allied Air Forces Central Europe, was conducted this summer in the air space of the FRG, Great Britain, the Netherlands, Belgium, Denmark and France as well as over the North Sea. In addition to NATO Allied Air Forces Central Europe, it included units and subunits of the British and French air forces, American tactical and strategic aviation, E-3 airborne early warning and control aircraft of the NATO AWACS Command and U.S. Air Force, as well as forces and resources of unit air defense. Problems of organization and conduct of air offensive and defensive operations employing conventional weapons were practiced during the exercise. Considerable emphasis was placed on execution of night missions.

**Israel**

•The Pyramid guided glide bomb with TV guidance system is being developed [razrabatyvatsya] by the firm of Rafael. Overall weight of the bomb is 360 kg and the warhead weighs 230 kg.

•Three prototypes of the Abir light Army vehicle are undergoing tests. The wheel arrangement is 4x4, the empty vehicle weighs 2.6 tons, it is 5 m long, 2 m wide and holds 11 persons. The diesel engine is 145 hp and maximum highway speed is 115 km/hr.

**Japan**

•The following were appointed in July 1987:

—Vice Admiral O. Goto, deputy CIC of Navy;

—Vice Admiral A. Terai, commandant of Yokosuka Naval District;

—Vice Admiral M. Kanasaki, commandant of Sasebo Naval District;

—Vice Admiral S. Tomita, commandant of Ominato Naval District;

—Vice Admiral K. Matsumoto, CIC of Naval Aviation;

—Vice Admiral F. Okabe, CIC of Training Aviation;

—Rear Admiral H. Kubo, commandant of Maizuro Naval District;

—Rear Admiral S. Takemura, inspector of the Navy;

—Rear Admiral K. Okada, chief of Naval Staff;

—Rear Admiral H. Okada, chief of staff of Naval Avaition;

—Rear Admiral K. Ito, chief of Hanshin PB [not further identified];

—Rear Admiral S. Uchida, commander of 2d Air Wing;

—Rear Admiral T. Nagura, commander of 4th Air Wing.

•The lead submarine of the new Type SS 583 was laid down in April 1987 at the Mitsubishi Jukogyo Shipyard. It is planned to launch her in July 1989 and turn her over to the Navy in December 1990. Initial appropriations for building a second ship of the series were made in the current fiscal year budget.

**Taiwan**

•The Sky Sword-1 air-to-air short-range all-aspect guided missile (own development [razrabotka] ) is in the inventory of the Taiwanese Air Force. It was created [sozdat] on the basis of the American Sidewinder guided missile and has a range of fire of 10-15 km.

**Australia**

•The country's Air Force command made the decision to recruit women for training as members of transport aircraft flight crews. After a 60-week training course they will be sent to the 34th Military Transport Squadron, which has the mission of carrying state figures and highly placed guests (Fairburn Air Base; BAC-111, Falcon-20 and HS-748 aircraft) and to navigator's school (East Side, HS-748).

•Six new diesel submarines, construction of which is to end in the first half of the 1990's, will be fitted with periscopes by the British firm of Barr & Stroud. A

contract concluded with this firm for 30 million pounds sterling provides for a transfer of technology to Australian firms for partial production of periscopes.

**Republic of South Africa**

*The country's military budget for fiscal year 1987/88 which began 1 April reached 6,903,000,000 rands (an increase of 30 percent compared with last year). This sum corresponds to 14.9 percent of the state budget and 4.6 percent of gross national production. Air Force appropriations increased to the greatest extent and will be 1.5 billion rands. The Army will receive 450,800,000 rands more than in fiscal year 1986/87 and the Navy will receive 76 million more.

**Argentina**

*Thirty new Tucano (EMB-312) trainers have been ordered in Brazil to replace the obsolete T-45 Mentor aircraft of American production.

**Brazil**

*The question is being considered about activating a second tactical air reconnaissance squadron in the Air Force. It is proposed to equip it with eight RF-5E aircraft through the modernization and refitting of existing F-5E fighters.

**Paraguay**

*Brigadier Gen V. Torres was appointed commander of 1st Cavalry Division.

**Uruguay**

*The following were appointed:

—Lt Gen C. Berois, CIC of the Army;

—Brigadier R. Galarza, commander of 1st Infantry Division.



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—Brigadier R. Galarza, commander of 1st Infantry Division.

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